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DEPARTMENT OF HEALTH SERVICES
714/744 P STREET
SACRAMENTO, CA 95814
(916) 445-7410

1989 CME REPORT

June 12, 1989

Lori Lewis
Office of Waste Programs
U.S. Environmental Protection Agency
Region IX
215 Fremont Street
San Francisco, CA 94105

Dear Ms. Lewis:

CME TRANSMITTAL, PG&E, TOPOCK, EPA ID NO. CAT080011729

Enclosed is a copy of the Comprehensive Ground Water Monitoring Evaluation (CME) and Compliance Monitoring and Enforcement Log (CMEL) for PG&E, Topock. This report is the second CME submittal for the 1988-89 grant commitments. Please note that the author, Mohammed Khan, Colorado River Basin, Regional Water Control Board, completed a well written report two weeks ahead of schedule. Department of Health Services and the Regional Water Quality Control Board are coordinating the follow-up to the report.

Sincerely,

Allen K. Wolfenden

Allen K. Wolfenden, Chief
Technical Services Unit
Toxic Substances Control
Division

Enclosure

cc: Karen Schwinn, EPA (W/O enclosure)
Michael Feeley, EPA (W/O enclosure)
Jeff Scott, EPA (W/O enclosure)
Paul Blais, DHS (W/O enclosure)
Rubia Bertram, DHS (W/O enclosure)
Jack Kearns, DHS (W/O enclosure)
Paula Rasmussen, DHS (W/O enclosure)
✓George Baker, DHS (Enclosure hand delivered)
Mohinder Sandu, DHS (W/O enclosure)
Ray Campbell, DHS (Enclosure hand delivered)
Elizabeth Lafferty, DHS (W/O enclosure)
John Adams, SWRCB (Enclosure hand delivered)
Gary Morris, RWQCB
Mohammed Khan, RWQCB

ck

SEU

STATE OF CALIFORNIA

MEMORANDUM

Date: May 17, 1989

To: Jonathan Mulder
Division of Water Quality
State Water Resources Control Board
Sacramento

MAK

From: Mohammed Khan, Staff Engineer
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION
73-271 Highway 111, Suite 21, Palm Desert, CA 92260
Telephone: (619) 346-7491

Subject: Final CME Report on PG&E - Topock

Enclosed please find six copies of the subject report. This report incorporates all technical comments on the draft CME Report (dated April 17, 1989) from DHS CME Task Force members and SWCRB RCRA staff (including yourself).

After review of the subject Report, please sign the Certification page and forward four signed copies of the Report to Brian Lewis (DHS CME Task Force Leader), retain one signed copy for SWRCB record and return the remaining signed copy t, me for Regional Board's file.

Should you have any questions, please contact me at (619) 346-7491.

MK/sw

Enclosures

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION

RCRA COMPREHENSIVE GROUND WATER MONITORING EVALUATION
FFY 1988-1989

FACILITY:	Pacific Gas and Electric Company, Topock Compressor Station - Needles, California
EPA ID NO.:	CAT 080011729
DATE OF INSPECTION:	March 7-8, 1989
DATE OF REPORT:	May 17, 1989
FACILITY CONTACT:	Patricia Sullivan (415) 972-6254
REGIONAL BOARD CONTACT:	Mohammed Khan (619) 346-7491

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N. Waste Discharge Requirements - Board Order No. 85-99

CERTIFICATION

On March 7 & 8, 1989, Mohammed Khan, Staff Engineer, with the California Regional Water Quality Control Board, Colorado River Basin Region (RWQCB), conducted a RCRA Comprehensive Ground Water Monitoring Evaluation (CME) field inspection of the ground water monitoring program at Pacific Gas and Electric Company, Topock Gas Compressor Station, Needles, California. The CME included a review of the facility's files and ground water quality monitoring reports and geological/hydrogeological reports prepared by consultants.

Present for the site evaluation and inspection were also the following:

1. Regulatory Agencies Staff Members:

   - Brian Lewis, (CME Task Force) DHS, Sacramento
   - Jonathan Mulder, SWRCB, Sacramento
   - Marcia Keesey, SWRCB, Sacramento
   - Elizabeth Lafferty, (CME Task Force) DHS, Long Beach
   - George Baker, DHS, Long Beach
   - Raymond Campbell, DHS, Long Beach
   - Monina Ligao, DHS, Los Angeles

2. PG&E Staff and Consultants

This report, with the attached Appendix A and Appendix B checklists, identifies the facility's level of compliance with applicable federal and state regulations at the time of inspection.

REPORT PREPARED BY:

MOHAMMED KHAN
Staff Engineer, RWQCB

TECHNICAL REVIEWS BY:

JONATHAN H. MULDER, C.E.G.
Associate Engineering Geologist, SWRCB
Registration No. 1352

Marcia Keesey

MARCIA KEESEY
Associate Engineering Geologist, SWRCB

2. INTRODUCTION

On March 7 & 8, 1989, California Regional Water Quality Control Board staff, Mohammed Khan and members of CME (Comprehensive Ground Water Monitoring Evaluation) Task Force conducted a field inspection, as part of the CME, at Pacific Gas and Electric (PG&E) Company's Topock Compressor Station near Needles, California. The purpose of this CME was to address compliance of the ground water monitoring program for PG&E's four surface impoundments with the Resource Conservation and Recovery Act, 40CFR Part 265, Subpart F (Interim Status Ground Water Monitoring).

The Task Force was comprised of the following members:

1. Brian Lewis, Engineering Geologist, (CME Task Force) DHS, Sacramento
2. Mohammed Khan, Staff Engineer, RWQCB
3. Jonathan Mulder, Engineering Geologist, SWRCB, Sacramento
4. Marcia Keesey, Engineering Geologist, SWRCB, Sacramento
5. Elizabeth Lafferty, Engineering Geologist, (CME Task Force) DHS, Long Beach
6. George Baker, Hazardous Materials Specialist, DHS, Long Beach
7. Raymond Campbell, Hazardous Materials Specialist, DHS, Long Beach
8. Monina Ligao, DHS, Los Angeles

The inspection included the following activities:

1. Visual site inspection.

2. Observing PG&E's method of water level measurements, well purging, sample collection and sample handling procedures.

3. Review of facility's Sampling and Analysis Plan.

4. Discussion of the following with PG&E's technical consultants and staff members:

   - Site Hydrogeology
   - Current monitoring well system
   - Facility's implementation of Sampling and Analysis Plan
   - Facility's compliance status with Interim Status Requirements

In addition split samples were obtained for analyses of the following:

1. Hexavalent Chromium and Total Chromium
2. Total Organic Carbon (TOC)
3. Total Organic Halogens (TOX)
4. pH
5. Total Dissolved Solids
6. Chlorides
7. Sulfates
8. Total Phosphate as Phosphorus
9. Iron
10. Manganese
11. Calcium

The following documents were also reviewed for evaluation of the facility:

1. "Construction, Development and Sampling of Topock Compressor Station RCRA Ground Water Monitoring Wells", August 1, 1986, submitted by PG&E, Department of Engineering Research.

2. "Quarterly and Annual Ground Water Monitoring Program Results" submitted by PG&E since 1986

3. "Regional Water Quality Control Board's CME Report", dated October 17, 1986 on PG&E's Topock Gas Compressor Station Ground Water Monitoring Wells.

4. "RCRA Facility Assessment, Preliminary Review, Pacific Gas and Electric Company Topock Compressor Station, Needles, California", prepared by A.T. Kearney, Inc. and Science Applications International Corporation, dated May 29, 1987.

5. Regional Water Quality Control Board's Waste Discharge Requirements for PG&E's RCRA Surface Impoundments - Board Order No. 85-99.

6. DHS, Southern California Section, Toxic Substances Control Division's Stipulation and Order: Topock Compressor Station, Docket Number HWCA 87/88-018, date of issue, March 9, 1988.

3.0 FACILITY BACKGROUND

3.1 FACILITY DESCRIPTION

Pacific Gas and Electric Company owns and operates a natural gas compressor station approximately 14 miles southeast of Needles, California, near the Colorado River in San Bernardino County (Figure 1, Appendix C). The compressor station, known as the Topock Compressor Station, consists of 10 natural gas compressor units with a total combined output of 35,000 horsepower. Natural gas from out-of-state sources is compressed at the Topock Station for transmission to PG&E markets in Northern California. The station has been in operation since 1951 and handles one third of PG&E's total natural gas supply.

Process water for all plant operations is obtained from three water wells in Topock, Arizona.

The compressor station has two wet, recirculating cooling towers which provide cooling of both the hot compressed natural gas leaving the compressor engines and lubricating oils used for the compressor engines. In recirculating water systems, constituents in the circulating water can become concentrated due to evaporative water losses. The concentrated constituents can cause scaling, corrosion, and biological fouling in the heat exchange equipment and cooling tower, resulting in a loss of heat transfer efficiency or damage to the equipment. To reduce the occurrence of these problems, a portion of the recirculating water is discharged continuously from the cooling tower. This is referred to as blowdown. In addition, chemicals are added to the makeup water (water replacing losses due to evaporation and blowdown) to assist in controlling these water quality problems. Blowdown from the Topock Compressor Station is continuous at an average rate of 13,432 gallons-per-day from each tower.

Currently, the blowdown is discharged to four surface impoundments (Figure 2, Appendix D). Ponds No. 2, 3 and 4 were constructed in 1974. The ponds are lined with a 20 mil PVC synthetic liner, underlain by 4 inches of sand and overlain by 10 inches of sand and 4 inches of native material. The inside sloping surface of each berm is spray coated with asphalt to prevent erosion. The ponds are equipped with a resistance grid leak detection system which monitors the soil immediately underlying the ponds. Total area of the ponds is 4.15 acres and a total depth of 6 feet. Total capacity based on the usable 5 feet depth is 4.9 million gallons.

In October, 1985, the California Regional Water Quality Control Board, Colorado River Basin Region adopted Board Order 85-99 (Appendix N) which allowed PG&E to replace the chromium based cooling water treatment program with a nonhazardous phosphate-based water treatment program. As a result of this conversion, the facility no longer generates hazardous wastewater.

3.2 HISTORY OF WASTE MANAGEMENT PRACTICE

From 1951 to 1969, untreated cooling tower blowdown (containing chromium) was discharged to a percolation bed, west of the compressor station, in the vicinity of Bat Cave Wash. PG&E estimated that approximately 6 million gallons per year of this wastewater were discharged to the percolation bed during this period of time. PG&E estimated that the total chromium concentration which included hexavalent chromium in the cooling wastewater was 10 ppm.

In 1969, PG&E began treating the cooling tower blowdown on-site using a two-step process. The wastewater was first treated using sulfur dioxide to reduce hexavalent chromium to trivalent chromium. Sodium hydroxide was then added to precipitate the trivalent chromium as chromium hydroxide sludge. This treated wastewater was also discharged to the percolation bed from 1969 to 1970.

From 1970 to 1974, the cooling tower blowdown was treated using the above two-step process, but in addition, a proprietary flocculent and ferric sulfate were used to further enhance the removal of chromium from the wastewater by precipitation. This treated wastewater was pumped into an underground injection well for disposal. The injection well, closed and capped in 1974, was not regulated by any public agency.

This inactive injection well, located west of the main compressor building, was designed and constructed to discharge wastewater below the uppermost aquifer and into a ground water basin that was determined unsuitable for domestic or agricultural use. It was drilled to a depth of 550 feet and constructed of a solid steel casing to a depth of 400 feet and a perforated steel casing from 400 to 550 feet. Cement grout was poured between the soil formation and the solid steel casing down to a depth of 400 feet.

During the period from 1974 to 1985, the cooling tower blowdown was treated using the two-step process and discharged to the four evaporation ponds. The use of the flocculent and ferric sulfate was discontinued in 1975. Settled solids were periodically removed from the ponds and trucked off site to the City of Needles Landfill. In 1984 DHS disallowed this practice. As a result, the solids were then disposed at an approved class I disposal site from 1984 through 1985.

3.3 REGULATORY HISTORY

PG&E submitted RCRA Notification of Hazardous Waste Activity on August 28, 1980 and a Part A Permit Application on November 17, 1980 to EPA, Region IX, for their hazardous waste management activities at the Topock Compressor Station. The facility also applied for Interim Status on November 19, 1980, to store and dispose of chromium wastes in evaporation ponds.

On April 6, 1981, DHS issued an Interim Status Document (ISD) for the

Topock Compressor Station. A condition of ISD required PG&E to install a ground water monitoring system around the evaporation ponds. PG&E began the implementation of a ground water monitoring system in October 1985 and completed it in early 1986.

PG&E received a formal request from EPA, Region IX, on May 8, 1985, to prepare a RCRA Part B Permit Application for their Topock Compressor Station. After a review of applicable regulations affecting the operation of Topock Compressor Station's hazardous waste management facilities, PG&E decided to close these facilities (including the four existing evaporation ponds). PG&E submitted a closure Plan on November 7, 1985. the Closure Plan was revised to incorporate DHS and RWQCB comments and resubmitted in August 1986. The current status of the revised Closure Plan is that DHS has approved it except for the Section on Soil Sampling Plan beneath the ponds, which is currently under review by DHS staff. PG&E anticipates closure of the Ponds to begin in September 1989 when construction of the new Class II ponds will have been completed. DHS is currently investigating for the presence of significant chromium contamination in the Bat Cave Wash area, including the inactive percolation bed.

3.4 ENFORCEMENT ISSUES

On March 9, 1988 DHS issued the current pending Stipulation and Order, Topock Compressor Station, Docket Number HWCA 87/88-018. This Order cites PG&E for violating provision of 40CFR Part 265 Subpart F (Interim Status Ground water Monitoring). These violations pertain to PG&E not having implemented a ground water monitoring system in accordance with standard requirements of 40CFR Part 265 Subpart F. The Order states the following Schedule of compliance:

> "If the results from the closure verification sampling indicate that a release of hazardous waste from the surface impoundments has occurred, Respondent shall implement a post-closure ground water monitoring system as described in 40CFR Part 265."

On May 19, 1987, California Regional Water Quality Control Board, Colorado River Basin Region made the determination that PG&E Topock Compressor Station's Evaporation ponds were not subject to regulations under the Toxic Pits Control Act.

4.0 ENVIRONMENTAL SETTING

4.1 SITE LOCATION

The PG&E Topock facility is located at the northern edge of the Chemehuevi Mountains in southern California near the Arizona border. The site slopes to the north with elevations ranging from 500 to 800 ft MSL (Figure 1). The site is situated in a series of hills and valleys at the foot of the mountain range. The site is about 0.5 miles east of the Colorado River,

The area in which the compressor station is located is an extremely arid area, with very little rainfall.

4.2 SURFACE HYDROLOGY

The site is bisected by a major surface drainage called Bat Cave Wash (Figure 2, Appendix D). Bat Cave Wash is a deep narrow gully which originates in the Chemehuevi Mountains and flows northeast into the Colorado River, located approximately one-half mile east of the compressor station.

Surface water is present at the site only during rare precipitation events. Flash flood runoff flows into the Bat Cave Wash, bypassing the evaporation ponds. No portions of the site are known to be in a 100-year floodplain.

4.3 SITE GEOLOGY AND HYDROLOGY

The compressor station complex is located in the southern portion of the Mohave Valley and the northern region of the Chemehuevi Mountains, underlain by a dissected piedmont slope. The bedrock complex, exposed in the surrounding hills, is composed of metadiorite, gneiss, and minor mica schist.

The major geologic units encountered in the subsurface include (in order of decreasing depth): (1) a highly fractured bedrock basement complex consisting of metadiorite and gneiss, encountered at a maximum depth of 235 feet; (2) a well cemented fanglomerate, 0 to 50 feet thick; (3) older alluvial fan deposits, comprised of gravelly sands and sandy gravels, 100 to 150 feet thick; (4) Chemehuevi Formation consisting of fine grained reddish sands and minor gravels, 35 to 50 feet thick; and (5) recent alluvial fan deposits, 0 to 19 feet thick. (See geologic cross sections, Figures 3 and 4, Appendix E)

Logs of several monitoring wells installed along the north perimeter of Pond 1 have shown that at least 100 feet of gravelly sand are encountered before bedrock of metadiorite is reached. Bedrock at MWP-7 is encountered at 100 feet, whereas bedrock at MWP-3 and MWP-8 is found at 190 feet, and at 100 feet, whereas bedrock at MWP-3 and MWP-8 is found at 190 feet, and finally a maximum depth to bedrock of 230 feet is reached at MWP-10. This demonstrates that bedrock slopes steeply away from the outcrop east of the four ponds. (See Bedrock Contour Map, Figure 5, Appendix F)

Typical sedimentary material described in the boring logs (see Bore-Hole Logs, Appendix J) is fine to medium sand with gravels derived from weathered bedrock. Extensive lateral variation is observed in the boring logs. The tertiary fanglomerate in contact with bedrock was not encountered in the monitoring well borings, but was encountered in wells P-1 and MWP-12 in thicknesses of 50 and 35 feet, respectively. Erosional processes were hypothesized to have removed the fanglometerate north and west of P-1 and MWP-12. Overlying the bedrock is a gradually thickening section of alluvial fan deposits of gray to brown, poorly sorted, sandy gravel and gravelly sand beds. A 50-foot thick sand bed is observed in MWP-1, expanding to a thickness of 100 feet at MWP-10. The Chemehuevi Formation lies above the alluvial fan; it ranges in thickness from 29 feet in MWP-7 to 45 feet in MWP-1 and MWP-10. This formation consists of reddish brown sand occasionally interbedded with moist, stiff, greenish to reddish brown clay. The clay was found to be laterally continuous north of the ponds, but not positively identified south of the ponds. Surficial deposits overlie the Chemehuevi Formation and are comprised of recent alluvial fans. This deposit does not exhibit a thickness of deposition which can be attributed to the slope of underlying bedrock, unlike the aforementioned units. This may be due to ongoing erosional processes to which surface sediments are exposed.

The metadiorite, fanglomerate, and older alluvial fan deposits are considered the only units containing significant amount of ground water in the evaporation pond area, and hence, comprise the aquifer system. High moisture content was observed at the alluvium/bedrock contact, suggesting that this interface may provide a recharge path for ground water. Ground water encountered in the metadiorite was confined to moist zones associated with fracture surfaces.

Sedimentary units comprising the aquifer include sandy gravels, gravelly sands, and minor fanglomerate. The fanglomerate is considered less permeable than the older alluvium due primarily to calcareous cementation. Geologic structural features (faults, folds) have not been adequately defined.

4.4 GROUND WATER MONITORING PROGRAM

PG&E developed a groundwater monitoring program for the Topock Compressor Stations's four evaporation ponds in response to ISD requirements. During the period from July, 1985 to February, 1986, a total of 17 borings were drilled (Figure 6, Appendix G.).

The 17 borings drilled in the vicinity of the ponds provided information to characterize the subsurface geology and hydrology. Of these borings, eight were completed as monitoring wells, two as piezometers, and seven were abandoned as geotechnical borings (Figure 6, Appendix G). Some wells have not been utilized for sampling due to dry conditions (MWP-7 and MWP-1) and construction problems (MWP-2 and MWP-4). These wells, except MWP-4, have remained open as observation wells and have provided subsurface geologic information. Well MWP-4 was destroyed in accordance with county health department requirements.

Based upon water level measurements, ground water flow is toward the northwest with a gradient of 0.1 foot per foot. (Figure 7, Appendix H). As a result wells MWP-3, MWP-12 and P-1 are upgradient and wells MWP-8, 9 and 10 have been designated as downgradient wells by the discharger. For details on the hydrogeology and ground water monitoring program refer to appropriate items in Appendices A and B checklists.

GROUND WATER QUALITY

The discharger has used the above ground water monitoring system (Figure 8, Appendix I) to determine the initial background concentration of the following parameters described in 40 CFR, Part 265:

1. Parameters characterizing the suitability of the ground water as a drinking water supply.

2. Parameters establishing ground water quality

   (i) Chloride
   (ii) Sulfate
   (iii) Iron
   (iv) Manganese
   (v) Sodium
   (vi) Phenols

3. Parameters used as indicators of ground water contamination.

   (i) pH
   (ii) Specific Conductance
   (iii) Total Organic Carbon (TOC)
   (iv) Total Organic Halogen (TOX)

   The discharger has been using the above established upgradient background data on contaminant Indicator Parameters in the Students T-test for data collected from the monitoring well system on a quarterly basis since 1986.

   The results of the T-test have consistently shown a significant difference in Specific Conductance (SC) value between downgradient well MWP-8 and upgradient well MWP-12 (Monitoring Data, Appendix M). The other downgradient well MWP-10 does not indicate a significant difference in SC value when compared with the value from MWP-12. For the discharger's explanation of this phenomenon, see comment to item No. 63 in Appendix A Checklist.

5. SUMMARY OF CURRENT GROUND WATER MONITORING SYSTEM EVALUATION

1. **SITE GEOLOGY:**

The geology with respect to stratigraphy and structure in the evaporation ponds area, particularly beneath the ponds and in the vicinity of monitoring well MWP-8, has not been adequately defined.

2. **SITE HYDROLOGY:**

a. It has not yet been definitely established that the "current uppermost aquifer" is in fact the uppermost aquifer. The moist to wet zones in the stratigraphically higher alluvial deposits have not been investigated for yielding enough water for sampling. The said zones may possibly be the uppermost aquifer (or part of it). The discharger should investigate these zones by using a suitable monitoring well system. The width and flow path of the aquifer beneath the ponds is not yet known with certainty. It is possible that the downgradient well MWP-8 may not be screened in the same aquifer as the remaining wells. The discharger should also determine the hydraulic interconnection between the alluvium and the bedrock.

b. The hydraulic conductivity (K), storage coefficient, transmissivity and speed of ground water flow have not yet been determined. The discharger should employ suitable tests to determine these parameter values; for example, a step-drawdown test would yield a value for K. The discharger should also investigate the presence of vertical gradients in the aquifer by use of staggered piezometers.

3. **GROUND WATER MONITORING WELL NETWORK:**

a. There are three upgradient wells, MWP-3, MWP-12 and P-1. MWP-3 has a 100 foot screen length and the other two have 40 foot screen lengths.

b. There are three downgradient wells, MWP-8, MWP-9 and MWP-10. MWP-8 has a 30 foot screen length and the other two have 40 foot screen lengths.

c. All wells are partially screened into bedrock.

d. Without an adequate understanding of the site hydrogeology, it is not possible to specify the adequate number of upgradient and downgradient monitoring wells (and whether these should be nested or single well systems), their lateral placement and screen depths.

e. Based upon the available hydrogeologic information, the number of upgradient wells is only one - MWP-12. MWP-3 has a 100 foot screen length, and this makes it unsuitable as a monitoring well. P-1 is used as a piezometer only. To account for spatial variation in ground water quality at least two upgradient wells about 150 feet apart and screened at the same depth interval are required. The discharger has not provided a justification for using a 40 foot screen length (and not shorter) for MWP-12.

f. The actual number of "effective" downgradient monitoring wells is one i.e. MWP-10 alone is suitably located. Whether the 40 foot screen length of MWP-10 is appropriate cannot be said at this time. Monitoring well MWP-9 is really a side gradient well and not downgradient. The following anomalies relate to MWP-8: (1) the local hydrogeology around mwp-8 is not well understood, (2) TDS values for MWP-8 is more than 100 percent higher than values for the other wells. These anomalies have not yet been resolved; and therefore, it cannot be said whether MWP-8 is currently a useful downgradient well. Further hydrogeologic investigation have to be conducted to resolve the anomalies relating to MWP-8. It appears that an additional monitoring well located equidistant between MWP-10 and 8 is required.

3. <u>COMPLIANCE STATUS WITH REQUIREMENTS OF 40 CFR PART 265 SUBPART F - INTERIM STATUS GROUND WATER MONITORING</u>:

The discharger is in non compliance with the following:

a. 40 CFR Section 265.90 (a) and (b) in that its ground water monitoring system is not capable of determining the facility's impact on the quality of ground water in the uppermost aquifer underlying the facility.

b. 40 CFR Section 265.91 (a) in that its ground water monitoring system is incapable of yielding ground water samples that adequately represent background and downgradient water quality.

c. 40 CFR Section 265.91 (c) in that monitoring wells have been improperly and inadequately screened.

d. 40 CFR Section 265.93 (a) in that the discharger has not yet prepared a ground water quality assessment program capable of determining:

(1) Whether hazardous waste or hazardous waste constituents have entered the ground water.

(2) The rate and extent of migration of these constituents.

(3) The concentration of these constituents in the ground water.

4. <u>RECOMMENDATIONS</u>

a. In order to adequately define the site geology (stratigraphy and structure) additional borings should be done along the median dike of the surface impoundments and on their southern and eastern sides.

These should enable the development of a sufficient number of east-west and north-south geologic cross-sections. Whenever possible, continuous coring method should be used. Gamma ray logging should be performed in each well and borings to aid in stratigraphic correlations.

Additional borings, coupled with appropriate geophysical techniques, should be used to define the local stratigraphy and structure (faults etc.) in the vicinity of monitoring well No. 8 (MWP-8). These investigations should be designed to aid in explaining the reason(s) for the high TDS observed in MWP-8 and to confirm whether or not MWP-8 in its current design and location is a useful downgradient monitoring well.

b. Staggered peizometers with discrete screen intervals should be used to investigate whether or not the moist to wet zones found in the higher alluvial deposits could form part of the uppermost aquifer, and therefore, may also require monitoring.

The above borings and investigations should help define the areal extent of the uppermost aquifer beneath and around the surface impoundments.

c. Step drawdown pump tests should be performed to determine the hydraulic conductivity of the aquifer formation.

When the site hydrogeology is adequately defined, it will then be possible to specify an adequate number and type of monitoring wells (staggered versus single wells, screen intervals) and their placement.

d. PG&E should prepare and submit to the regulatory agencies a ground water assessment program outline.

e. PG&E should also submit the results of all analyses done on the soil samples collected during the soil boring program. These samples were reported to have been sent to PG&E's Department of Engineering Research for analysis.

REVIEW OF HYDROGEOLOGIC REPORT AND WRITTEN GROUND WATER MONITORING PROGRAM

Company Name Pacific Gas & Electric Co.

EPA ID No. CAT 080011729

Company Address 77 Beale Street
San Francisco, CA 94120

Date February 2, 1989

Reviewer's Name Mohammed Khan, RWQCB # 7

Geologic Consultant Alpha Geotechnical Consultants & Louke & Associates

Consultant's Address

Reviewer's Civil Service Classification Water Resource Control Engineer

Type of Facility	Lined	Liner Type	Number of Each Unlined	Double Lined	Liner Ty
(a) Surface Impoundment	4	20 mil PVC			
(b) Landfill					
(c) Land Treatment Facility					
(d) Disposal Waste Pile					

For all double-lined facilities:	Yes	No	Unknown
Is there a leak detection system?		NA	
Has leakage ever been detected?			

If yes to above, describe

Note: Most items checked under 'No','Yes' and 'Unkown' have accompanying comments listed at the end of this checklist.

	Yes	No	Unknown
1. Has the owner/operator (O/O) conducted a hydrogeologic assessment of this site?	X		
2. Has O/O identified the uppermost aquifer?		X	
3. Are there other aquifers that may be hydraulically interconnected?	X		
4. Are these other aquifers identified?		X	
5. Does O/O have enough information to provide a reasonable understanding of the site's subsurface and to support the placement of wells capable of determining the facility's impact on the uppermost aquifer?		X	
6. Did the O/O use appropriate techniques to collect and interpret the information used to support well placement?		X	
7. If yes to question 6, what techniques were used?			
8. Is the site being monitored at this time?	X		
9. Is the site being monitored under detection, assessment, or corrective monitoring?	Detection		
10. Does the facility have a ground water assessment program outline?		X	
11. Does the outline contain all of the elements necessary to determine the rate, nature, and extent of any leaks?		NA	
12. Was the hydrologic assessment report written by a qualified geologist?	X		
13. Was the report accompanied by adequate support data, including:			
Drill Logs	X		
Geologic Maps	X		

		Yes	No	Unknown
	Topographic Map(s)	X		
	Cross Sections	X		
	Referenced Literature	X		
	Other (list ____________________)		NA	
14.	Was the boring program adequate to meet your evaluation needs?		X	
15.	Was the number of cross sections adequate?		X	
16.	Were the cross sections adequately detailed and at a scale that shows geologic features beneath the facility that affect the integrity of each waste management area?		X	
17.	Were the details on the cross sections corroborated by adequate support data?		X	
18.	Have ground water flow directions been determined?	X		
19.	Was flow direction determined on basis of piezometric data?		X	
20.	Was there evidence of a vertical gradient?			X
21.	Was there mixing of data from wells and piezometers?		NA	
22.	Were O/O conclusions about flow direction demonstrated with support?	X		
23.	If piezometers were used, what was screen length?		NA	
24.	How many piezometers were used?		NA	
25.	What was depth of piezometers?		NA	
26.	Is there a rationale presented for the location and depth of each piezometer?		NA	
27.	Did the O/O determine the hydraulic conductivity?		X	

		Yes	No	Unknown
28.	What was method used to determine hydraulic conductivity?		NA	
29.	Was the method used to determine hydraulic conductivity fully demonstrated with support data, including drawdowns, well layout(s), curve match points or straight line segments used, quantities of water injected or withdrawn and rate?		NA	
30.	Provide values determined for:			
	Transmissivity No value determined			
	Storage Coefficient No value determined			
	Leakage No value determined			
	Hydraulic Conductivity No value determined			
31.	Were sufficient hydraulic conductivity determinations made to document lateral and vertical variation in hydraulic conductivity in the entire subsurface below the site?		X	
32.	Are there as builts of all monitor wells and piezometers?	X		
33.	Did the O/O construct a flow net of the ground water movement on his site?		X	
34.	Are there variations in flow direction due to:			
	Intermittent pumping of nearby wells?		X	
	Seasonal variations?		X	
	Tidal or other variations?			X
35.	How many upgradient wells have been constructed?	Two (MWP-3 & MWP-12)		
36.	Is this an adequate number based on data in the hydrogeologic report?		X	
37.	How many downgradient wells have been constructed?	Three (MWP-8, 9, 10)		

	Yes	No	Unknown
38. Is there a rationale presented for the location of each monitoring well?	___	X	___
39. Is this an adequate number of downgradient wells on the basis of the hydrogeologic report?	___	X	___
40. Are there wells at the compliance point?	___	X	___
41. Are the downgradient wells located properly to intercept leakage?	___	X	___
42. Are the wells screened in the uppermost aquifer?	___	X	___
43. Are the wells screened at intervals where contaminants would be expected?	___	X	___
44. What is the screen length of wells?	See Comment		
45. What was the method used to drill the wells?	See Comment		
46. What was the method used to develop the wells?	Surging		
47. Are the wells sealed?	X	___	___
48. What is the sealant material?	Bentonite Pellets		
49. Is there a seal between the filter pack and the cement?	X	___	___
50. If the seal between the filter pack and the cement is bentonite, what is the size of the particles? (½" pellets, ¼" pellets, coarse grit).	1/2" pellets for P-1, MWP-8, 9. 1/4" pellets for MWP-10 &		
51. Is the bentonite described in 50 above the water table?	___	___	X
52. What is the casing material?	3-inch I.D. SCH 80 PVC		

	Yes	No	Unknown
53. What is the screen material?	3-inch I.D. SCH 80 PVC		
54. Is there evidence of the methods used to select filter pack and screen slot size?	X		
55. Is the filter pack appropriate for the aquifer in which it is placed?			X
56. What is the size of the annular space?	See Comment		
57. Is the screen slot size appropriate for the filter pack used?	X		
58. Is there a written sampling and analysis plan?	X		
59. Does the sampling and analysis plan provide for:			
Written procedures for purging wells?	X		
Providing clean equipment for sampling each well?	X		
Are the sampling materials specified appropriate to the waste types being monitored?	X		
What sampling equipment and materials are specified?	See comment		
Avoidance of contamination of equipment transported to each location?	X		
Measuring water levels?	X		
Recording water levels?	X		
Recording depth of well?	X		
Recording any problems encountered at each well?	X		
Measuring pH and specific conductivity in the field?	X		

	Yes	No	Unknow
Collecting samples of ground water without degassing of volatile organics?	X		
Use of appropriate equipment?	X		
Use of blanks, spikes, etc.?	X		
Details of sample preservation?	X		
Methods of analyses to be used?	X		
60. Have comparisons of ground water contamination indicator parameters for upgradient well(s) shown a significant increase (or pH decrease) over initial background?		X	
61. Have comparisons of indicator parameters for downgradient wells shown a significant increase (or pH decrease) over initial background?	X		
62. If yes to 61, were additional ground water samples taken from those downgradient wells where the significant difference was determined?	X		
63. If yes to 61, what was source of significant increase over initial background?	See comment		
64. If yes to 61, has the O/O submitted an assessment program?		X	
Has this program been approved?		NA	
65. Has O/O compared monitoring data collected downgradient to that from upgradient for a period of at least one year?	X		
66. Was it determined that hazardous waste or hazardous waste constituents from the facility have entered the ground water?		X	

67. [illegible] to above, has there been a determination of the rate of migration of hazardous waste or hazardous waste constituents from the facility?		NA	
68. If yes to 67, list the constituents originating from the waste management area.	NA		
69. List the wells which have shown statistically significant increases.	MWP-8		
70. Were the significant increases in contaminant concentration determined through the use of the Student's t-test?	X		
If no, which test was used?	Student's T-test (Average Replicate T-test		
Was this an appropriate test?	X		
71. List the chemical and physical properties of the contaminants which have been detected in the ground water (density, solubility, etc.).	Specific Conductance		
plus highest values for TDS, Na, Cl & SO_4			
72. Are there differences between up and downgradient wells which qualitatively suggest there may be a leak?		X	
73. Has the O/O opted to know or assume there is a leak in lieu of performing a statistical test?		X	
74. List wells that show qualitative increases (or pH decrease) and parameters that are shown to increase (or decrease if pH).	MWP-8 (Specific conductance)		

	Yes	No	Unknown
75. Has the extent of the migration of hazardous waste or hazardous waste constituents been determined?	___	NA	___
76. If yes to above, list method used (additional monitor wells, geophysical methods, computer modeling, etc.).	NA		
77. Are the locations of additional wells shown on the map?	___	NA	___
78. Are the locations of additional wells reasonable on the basis of the data provided?	___	NA	___
79. Are the depths of additional wells reasonable on the basis of the data provided?	___	NA	___
80. Is the ground water monitoring program described in the hydrogeologic assessment report adequate for this site?	___	X	___

81. List dates of all quarterly, semiannual, and annual reports received. 1-14-86, 1-15-86, 5-5-86

7-28-86, 11-14-86, 1-16-87, 5-19-87, 8-20-87, 11-23-87, 1-15-88, 4-8-88, 7-25,88, 10-20-88, 1-15-89

82. List dates of all incidents and incident reports received. NA

83. List any reports missing. NA

	Yes	No	Unknown
84. Have all reporting requirements been met?	___	X	___

Signature of Reviewer

MOHAMMED KHAN
RWQCB Staff Engineer

PG&E TOPOCK COMPRESSOR STATION

COMMENTS ON APPENDIX A CHECKLIST ITEMS

The following comments correspond to the checklist it numbers
Type of Facility

(a) At the Topock gas compressor station, PG&E has four surface impoundments which are used for evaporation of cooling tower blowdown wastewater. The four surface impoundments are lined with a 20 mil PVC synthetic liner which is underlain by 4 inches of sand and overlain by 10 inches of sand and 4 inches of native material. The inside sloping surface of each berm is spray coated with asphalt to prevent erosion. The surface impoundments are immediately underlain with a resistance grid leak detection system which monitors soil moisture.

1. The discharger has conducted a hydrogeologic assessment of the site. The report "Construction Development and Sampling of Topock Compressor Station RCRA Ground Water Monitoring Wells" (hereinafter referred to as the report), dated August 1, 1986, which the discharger submitted to the Regional Water Quality Control - Colorado River Basin Region, includes this hydrogeclogic assessment of the site.

2. The surface impoundment site is underlain (in ascending order) by the following geologic units:

   1. A highly fractured bedrock basement complex composed of metadiorite and gneiss.

   2. A calcareous well cemented fanglomerate, 0-50 feet thick.

   3. Older alluvial fan deposits consisting of gravelly sands and sandy gravels 100-150 feet thick.

   4. Chemehuevi Formation consisting of fine grained reddish sands and minor gravels, 35-50 feet thick.

   5. Recent alluvial fan deposits, 0-19 feet thick.

   The discharger considers the fanglomerate and part of the lower portion of the older alluvial fan as comprising the first aquifer. This is based on the assumption that only the screened interval in these units could yield enough water for sampling.

   The discharger however, reports that "during boring free subsurface water was not encountered in any of the bore holes, although thin moist to wet zones were occasionally penetrated in the alluvial fan and fanglomerate units. A significant saturated zone was encountered between 123 and 125 feet (534-536 feet msl) in MWP-3."

Further, the wells were all drilled into bedrock (the migration of ground water is assumed to occur at the interface between the weathered bedrock and the overlain alluvial deposits) and with sufficient time, water collected in the screened interval of all completed monitoring wells and "piezometers". The screened intervals vary from 30 to 100 feet. It appears possible that the unscreened thin moist to wet zones in the higher alluvial fan deposits, if allowed the same time for water collection, may yield enough water for sampling. These moist to wet zones may be the effective uppermost aquifer.

3. It is unknown at this time if these moist to wet zones are hydraulically interconnected.

4. The moist to wet zones within the alluvial fan deposits have not been investigated.

5. & 6. To provide a basis for understanding the site's subsurface, and to support the placement of monitoring wells, the discharger conducted 17 geotechnical borings and a seismic refraction survey. Gamma ray geophysical logs were run on monitoring wells MWP-2, MWP-7 and MWP-10. However, the results of said borings and investigations failed to adequately define the uppermost aquifer and to yield enough information for the proper placements of all the wells. The study did yield sufficient information to determine the general upgradient and downgradient position of the wells. Additional borings are required near the impoundments and median dikes in order to adequately define the stratigraphy beneath and around the impoundments and to estimate the width of the uppermost aquifer beneath and immediately beyond the impoundments. The discharger needs to show by installation of additional sampling wells whether the thin moist to wet zones in the higher alluvial deposits could yield enough water for sampling. This information would aid in defining the true uppermost aquifer.

10. The facility has not developed a ground water assessment program outline.

12. The report was signed by T.M. Turner, Certified Geotechnical Engineer (Certificate No. 843).

13., 15. & 16. Support data provided was not sufficient to provide an adequate understanding of the geology and hydrology beneath the site. The drill logs show soil/rock samples taken at 10 foot intervals, soil samples were collected, visually logged and classified by a geologist (Alpha Geotechnical Consultants) using the Unified Soil Classification system. Selected bag samples were stored and shipped to PG&E's Department of Engineering Research for additional laboratory analysis; however, what laboratory analyses have been performed has not been stated in the report submitted to the Regional Board. A Project Geologic Map intended for a general overview of the vicinity and a site specific Geologic Map have been included as part of the report. The Topographic Map submitted has a scale of 1" : 100'.

The number of geologic cross-sections developed were inadequate for defining the site stratigraphy. Only two cross-sections were made (one N-S and one E-W). The accuracy of the N-S cross-section is questionable because the lithology was interpolated over too great a distance beneath the impoundments (i.e. from P-1 to MWP-10 = 550 feet).

14. Additional borings nearer the impoundments and along the median dike would provide the necessary information to adequately define the stratigraphic relationships beneath the site. (Provided that continuous coring and finally, gamma logging is done on each well or boring to effect correlation between the wells.)

17. For the N-S cross-section, an additional boring along the median dike of the impoundments would help corroborate or more accurately depict the details of this N-S cross-section. The seismic refraction survey for the E-W cross-section failed to define the stratigraphy in the vicinity of MWP-8 i.e. it could not distinguish to presence of a bedrock ledge from a fault. Additional borings near MWP-8 would help define the local stratigraphy.

18. Flow direction has been determined to be generally towards the Northwest. There is a pronounced gradient of 0.1 foot per foot as measured between MWP-12 and MWP-10.

19. The discharger refers to P-1 (40 feet screen length) and P-2 or MWP-12 (40 feet screen length) as piezometers. The 40 foot screen length of these wells makes them unsuitable for use as piezometers. Flow direction was based on static water level measurements taken in upgradient and downgradient wells.

(20) Vertical gradients were not addressed in the report submitted by the discharger.

(22) Flow direction was supported by static water level measurements in upgradient and downgradient wells.

23. See comments on item 19.

27., 28. & 29. Hydraulic conductivity has not been determined. The discharger should use a suitable pump test such as a step drawdown test to determine the hydraulic conductivity of the aquifer formation.

30. The discharger did not provide any values.

31. See comment on items 27., 28. & 29.

32. The as-builts of all the wells have been included in Appendix J of the of the report.

33. A water level contour map based on static water elevations of all monitoring wells (including "piezometers") has been included in the report.

34. There are no near by pumping wells. Water level contour maps based on quarterly static water level measurements in the upgradients since 1986 indicate the same flow direction. It is unknown at this time if there is any other "variation" that could alter the flow direction of the ground water.

35. Both upgradient wells MWP-3 and MWP-12 are sampled quarterly by the discharger; however, only results of the sampling analyses from MWP-12 are used in the Student's t-test. This is so, because MWP-3 has a screen length of 100 feet.

36. Since MWP-3 has a 100 foot screen length, it is not suitable as an upgradient well. This means that there is only one upgradient monitoring well i.e. MWP-12. Moreover, there were zones encountered during drilling (moist to wet zones) above the screened intervals of MWP-3 and MWP-12 (only moist zones) that could possibly yield enough water for sampling and could provide potential contaminant transport routes within the alluvial deposits. Staggered piezometers with discrete screen intervals could help to identify the existence of these zones.

37. & 39. The discharger's only rationale for the location of monitoring wells MWP-8, 9 & 10 seems to be due to the observation that static water level measurements indicated that these wells, spaced laterally about 185 feet apart from each other, were generally in the down gradient direction, and hence could serve as downgradient monitoring wells. However, the water level contour map in the hydrogeologic report indicates that MWP-9 is not properly located in the sense that as currently located it is not a true down gradient well (but a side gradient well). Monitoring well MWP-8, though appearing to be located in the down gradient direction may or may not be a useful down gradient well because the local stratigraphy and hydrology in the vicinity of MWP-8 is not adequately understood. Only MWP-10 is a true downgradient well.

40. The downgradient wells are not placed at the limit of the surface impoundments and therefore are not strictly at the compliance point. However, due to a power line and unpaved road which are adjacent and downgradient to the impoundments, the wells could not be placed closer than their current location.

41.,42. & 43. MWP-9 being a side gradient well, cannot intercept leakage. It cannot be said definitely whether MWP-8 could or could not intercept leakage because the local stratigraphy and local hydrology at MWP-8 is not understood. Only MWP-10 is ideally located to intercept leakage. Regarding the screened interval of these wells, these may not have been screened in the uppermost aquifer. The moist zones above the screened intervals in the alluvium need to be investigated by the installation of suitable staggered piezometers to identify if these zones could be the uppermost aquifer and if they are hydraulically connected with the current "uppermost aquifer".

44. The wells have the following screen lengths:

MWP-3	100 Feet
MWP-12 (or P-2)	40 Feet
P-1	40 Feet
MWP-8	30 Feet
MWP-9	40 Feet
MWP-10	40 Feet

45. Monitoring wells MWP-3 and MWP-12 were advanced to bedrock using Layne-Western's Drill Master air percussion rig, utilizing a 10-inch outside diameter (O. D.) hammer and a 9-inch O. D. casing. Layne-Western's rotary air hammer Porta Drill rig with a 5 1/4 inch O.D. hammer and casing was used to advance into bedrock. Monitoring wells MWP-8, 9 and 10 were advanced from the surface into bedrock with the Drill Master rig as described above.

46. All wells were developed by surging with a 4-foot long, 2-inch diameter bailer and then bailing until the sand was no longer evident.

47., 48. & 49. According to the submitted as-builts, the wells are sealed only at the top of the filter pack. No bottom seals were placed.

51. It is unknown if the bentonite has been placed above the water table since no subsurface water was encountered during drilling and there 's a lack of understanding of the moist to wet zones within the alluvium.

54. It appears that submitted sieve analyses results for MWP-12, P-1, MWP-8, 9 & 10 were used to select filter pack and screen slot size. No sieve analyses for MWP-3 were submitted.

55. Based on the results of sieve analyses, it appears that the filter pack is appropriate for the aquifer in which it is placed.

56. MWP-8, 9 and 10 have a 2 1/2 inch annulus. MWP-3 has a 1.75 inch annulus from 189-222 feet. P-1 has an annulus of 3 1/2 inch down to 205 feet and an approximate 1 inch annulus from 205-217 feet. MWP-12 has an annulus of 3 1/2 inch down to 133 feet and approximately a 1 inch annulus from 133-143 feet.

57. It appears that the screen slot size is appropriate to hold back 100 percent of the filter pack. No. 2, No. 3 or 12/20 Monterey filter sand was used with 0.01 inch screen slot size.

59. At least 3 casing volumes are purged from each well. The sampling equipment and materials include the following:

a. Beckman pH I21 - pH meter
b. Markson Model S-10B - conductivity meter
c. 0.45 micron in-line filter and peristaltic pump

d. Hach DREL/IC Spectrophotometer for field hexavalent chromium measurement
e. Well Wizard Model P1201 dedicated bladder pump equipped with Teflon bladder and Teflon-lined discharge tubing, controller, and nitrogen
f. Olympic well probe and steel tape for water level indication

Static water levels, total depth of wells, pH and specific conductance are to be measured and recorded in the field for all monitoring wells and "piezometers".

The Sampling and Analyses Plan also specifies the use of appropriate equipment, trip blank, spiked samples, details of sample preservation and methods of analyses to be used.

60. No significant differences for upgradient wells MWP-12 and MWP-3 over the initial background were observed when an average replicate t-test was performed at 0.01 significance level.

61. MWP-8 has consistently shown a significant difference (increase) in specific conductance value over the initial background value. This significant difference is apparent with or without the use of the Student's T-test. This difference is reflected in the quarterly sampling results since 1986.

63. At this time the source of significant increase over the initial background is not known for certain. The discharger has offered the following explanation:

1. The observed difference in the values of specific conductance (total dissolved solids content) between well MWP-8 and upgradient well MWP-12 could not be due to contaminant leakage from the ponds because the pond water is of the NaCl type, whereas the water from MWP-8 is of CaCl type. Further, well MWP-10 has not shown significant change in specific conductance value from that recorded in up gradient well MWP-12.

2. The observed high values in specific conductance sodium, chloride and sulfate ions could be the result of "localized, natural physical or chemical processes operating in the vicinity of MWP-8" such as the introduction of "highly mineralized water into the alluvial aquifer from a fault zone in the vicinity of MWP-8, or through fractures in the metadiorite at MWP-8. Depressions or other irregularities in the bedrock surface could also produce localized zones of relatively stagnant ground water along the contact between the metadiorite and the unconsolidated alluvial deposits."

64. The discharger has not submitted an assessment program because the discharger does not believe that the ponds are leaking for reasons explained in comment to item No. 63.

65. Monitoring data have been collected and compared for upgradient and downgradient wells for more than two years.

66. It has not been determined that hazardous waste or hazardous waste constituents have migrated from the ponds to the ground water. Also see comment to item No. 63.

72. Only MWP-8 shows significant difference in the parameter specific conductance when compared with the sample parameter in upgradient well MWP-12. Not enough information exists at this time to evaluate whether the ponds are leaking.

84. The discharger has not submitted a ground water assessment program outline.

Appendix B

**FIELD REVIEW OF HAZARDOUS WASTE DISPOSAL SITE
TO DETERMINE COMPLIANCE WITH GROUND WATER MONITORING REQUIREMENTS**

Company Name Pacific Gas & Electric Co. **EPA ID No.** CAT 080011729

Company Address 77 Beal Street **Date** March 3, 1989

San Francisco, CA 94120 **Reviewer's Name** Mohammed Khan

Geologic Consultant Alpha Geotechnical Consultants & Louke and Associates RWQCB #7

Consultant's Address ---

Reviewer's Civil Service Classification Water Resource Control Engineer

Type of Facility	Lined	Liner Type	Unlined	Double Lined	Liner Ty
(a) Surface Impoundment	4	20 mil PVC			
(b) Landfill					
(c) Land Treatment Facility					
(d) Disposal Waste Pile					

(Number of Each)

	Yes	No	Unknown
For all double-lined facilities:			
Is there a leak detection system?		NA	
Does the leak detection system currently have liquid in it?			
Is there any indication that leakage has occurred?			

If yes to above, describe ______________________

NOTE: Most items checked under 'NO', 'YES' and 'UNKOWN' have accompanying comments listed at the end of this checklist

	Yes	No	Unknown
1. Was the ground water monitoring program and geologic assessment report reviewed prior to site visit?	X		
2. Has the ground water monitoring plan been implemented?	X		
3. Do the plans and descriptions provided in the geologic report accurately reflect:			
Site geology, including lithology, structure, primary and secondary permeability?		X	
Site topography?	X		
Current status of facilities?	X		
4. Is a regional map of the area, with the facility delineated, included in the report?	X		
5. If yes, what is the scale?	1 inch : 1000 feet		
6. Is there a topographic map of the site at a scale of 1 inch = 200 feet that shows the topography and all units present at the facility?	X		
If not 1 inch = 200 feet, show scale.	in inch : 100 feet		
Show contour interval.	10 feet contour interval		
7. Are there any streams, rivers, lakes, or wetlands near the facility?	X		
8. If yes to above, list and give approximate distance and indicate apparent up- or downgradient direction.	Colorado River 3500 feet east		

of the basins (downgradient)

		Yes	No	Unknown
9.	Is there any evidence in these adjacent water bodies of contaminants coming from the facility?		X	
	What is the evidence?		NA	
10.	Are there any discharging or recharge wells near the facility?		X	
11.	If yes to above, list and give approximate distance and indicate apparent up- or downgradient direction?		NA	
12.	Is a site water table contour map included in the geologic report?	X		
13.	Does the contour map appear logical on the basis of topography and observed data?	X		
14.	Are static water levels shown?	X		
15.	Is at least one monitoring well located in the area that appears to be hydraulically upgradient?	X		
16.	List all upgradient wells by number	MWP-3 & MWP-12 & P-1		
17.	Are at least three monitoring wells located in an area that appears to be hydraulically downgradient?		X	
18.	List all downgradient wells by number	MWP-8 & MWP-10		
19.	Are there any seeps or wet areas downgradient of the facility?		X	
20.	Are there downgradient areas that appear to be in need of additional monitoring wells?	X		
	If yes, describe the locations.	See comment		

	Yes	No	Unknown
21. List the number of wells at the site.	6		
22. Are there concrete surface seals?	X		
23. Are the wells capped?	X		
24. Do the caps lock?	X		
25. Are there protective standpipes in place around above-ground wells?	X		
26. Is the plot plan used for the inspection the same as the one in the monitoring program plan documentation?	X		
27. Are all components of the facility identified during the field review addressed in the monitoring program documentation?	X		
28. Are monitor well locations and numbers observed at the site in agreement with locations and numbers shown in the hydrogeologic report which documents the monitoring program?	X		
29. Were locations and elevations of the monitor wells surveyed into some known datum?	X		
30. When you sounded the wells to determine total depth, were there discrepancies between your measurements and the listed depths of greater than two feet?	See comment		

31. List those wells where your measured depth differed from the listed depth by more that two feet. See comment

32. If any wells were not sounded to determine total depth, list the wells by number and explain the reason each was not sounded. MWP-3, 12, 8, 9, 10 & P-1

	Yes	No	Unknown
33. Was ground water encountered in all monitoring wells?		X	
34. List any wells which were dry.	MWP-1 & 7		
35. Are samples from any well turbid (where turbidity means fine material from the aquifer, not chemical or biologic reactions in the well)?		X	
36. List wells that produce turbid samples?	See comment		
37. What material (Teflon, stainless steel 316 or 304, PVC, etc.) was used in the construction of the well casing? Schedule 80 PVC Well screen? Schedule 80 PVC			
38. Is there a copy of the sampling plan at the facility?	X		
39. Is the plan being followed in regard to:			
Sampling schedule?	X		
Sampling methods?	X		
Sample preservation	X		
Sample handling?	X		
Sample analysis?	X		
Record keeping?	X		
40. List any deviation from the sampling and analysis plan.	See comment		
41. Are organic constituents to be sampled?	X		
42. Are samples collected with appropriate equipment and methods to minimize absorption and volatilization?	X	See comment	
43. Are appropriate sample preservation and preparation procedures being followed (filtration and preservation, as appropriate)?	~~X~~	~~See comment~~	

	Question	Yes	No	Unknown
44.	Are samples refrigerated?	X		
45.	Are Environmental Protection Agency (EPA) recommended sample holding period requirements being adhered to?	X		
46.	Are suitable container types being used?	X		
47.	Is a chain of custody control procedure clearly defined?	X		
48.	Is sample analysis performed by a qualified laboratory?	X		
49.	Name of laboratory performing analyses?	Brown and Caldwell Emeryville Laboratory		
50.	Are analytical methods described in the records?	X		
51.	Are the required ground water quality parameters being tested for? (Chloride, phenol, etc.)	X		
52.	Are the required ground water contamination indicator parameters being tested for? (pH, Conductance, total organic carbon, total organic halogen)	X		
53.	Are any analytical parameters determined in the field?	X		
54.	Are field activity logs included?	X		
55.	Are field activity logs filled in as samples are being collected?	X		
56.	Are the names and position of the field personnel included in the field logs?		X	
57.	Is an analysis program set up to determine the presence of contamination using EPA guidelines?	X		
58.	Have all record keeping requirements been met?		X	

	Yes	No	Unknown
59. List all records kept at the facility.	See comment		
60. Are there relevant records at the facility which should be provided to the Department?		X	
If yes, list them.			
61. Brief summary of site conditions and comments on the ground water monitoring program at this site.	See comment		
62. Is a more detailed technical evaluation required to determine the adequacy of the ground water monitoring program at this site?		X	
Why?	See comment		

PG&E TOPOCK COMPRESSOR STATION

COMMENTS ON APPENDIX B CHECKLIST ITEMS

The following comments correspond to the Checklist item numbers:

Type of Facility

(a) At the Topock Gas Compressor Station; PG&E has four surface impoundments which are used for evaporation of cooling tower blowdown wastewater. These four surface impoundments are lined with a 20 mil PVC synthetic liner which is underlain by 4 inches sand and overlain by 10 inches of sand and 4 inches of native material. The inside sloping surface of each berm is spray coated with asphalt to prevent erosion. The surface impoundments are immediately underlain with a resistance grid leak detection system which monitors soil moisture.

2. Detection ground water monitoring was started in December 1985.

3. The plans and descriptions provided in the geologic report do not accurately delineate subsurface geology with respect to lithology and structure. The description of the details of the stratigraphy are based on insufficient data and possibly inaccurate assumptions. Local geology surrounding MWP-8 is not sufficiently defined to provide a satisfactory understanding of the local geology. See comments on Appendix A checklist items 2, 5, 6, 13, 14, 15, 16 and 17. Values of primary and secondary permeabilities have not been determined. The discharger should conduct a step draw-down pump test to find the hydraulic conductivity of the aquifer.

7 & 8. There is one river near the facility. The Colorado River is approximately 3,500 feet east of the basins (downgradient).

9. There is no evidence in the Colorado River of contaminants originating from PG&E facility.

12. A site water table contour map has been provided and has been included in this report.

13. The site water table contour map appears logical based on the general topography of the area, information on the subsurface geology and the static water level measurement in the monitoring wells.

15. Based on static water level measurements there are 3 upgradient wells MWP-3, MWP-12 and P-1.

17 & 18. There are two downgradient wells MWP-8 and MWP-10. MWP-9 is not a true downgradient well (side gradient well).

19. The site is bisected by a major surface drainage called Bat Cave Wash. Bat Cave Wash is a deep narrow gully which originates in the Chemehuevi Mountains, flows northeast into the Colorado River and is located approximately one-half mile east of the compressor station. Flash flood or precipitation runoff flows into the Bat Cave Wash and bypasses the evaporation ponds. There was some residual water collected in a portion of the Bat Cave Wash located about 2,000 feet east of the ponds. No evidence of seepage from the ponds was observed either downgradient or upgradient of the ponds.

20. Since the site hydrogeology is not adequately understood, it is not possible to comment on an adequate number of downgradient monitoring wells (their locations and screen depth) that would be required. However, based on the available information, the number of downgradient monitoring wells appears inadequate. It is not certain whether MWP-8 is screened in the same aquifer as the remaining wells, so additional clustered piezo meters may be needed to replace MWP-8, and also to investigate the anomaly relating to MWP-8. The distance between MWP-8 and MWP-10 is about 200 feet. An additional monitoring well located equidistant from MWP-8 and MWP-10 appears to be necessary.

21. Total number of operating wells are six: Three are upgradient, two are downgradient and one is side gradient. Upgradient well MWP-3 has a 100 foot screen length; and therefore, analyses results from this well are not used for statistical analyses. P-1 is used as a piezometer. Only MWP-12 is used as an upgradient well.

27. The monitoring program does not address the following two <u>inactive</u> solid waste management units.

1. <u>Percolation Bed</u>: This unit is located west of the compressor station, in the vicinity of Bat Cave Wash. The percolation bed was used from 1951 to 1969 for the disposal of untreated cooling tower blowdown containing chromium (10 ppm total Cr) PG&E estimates that approximately six million gallons of wastewater were disposed each year during this period. From 1969 through 1970, the cooling tower blowdown was treated to remove chromium prior to discharge to the percclation bed. The use of this unit was discontinued in 1970. DHS is currently investigating if the soil and groundwater could have been contaminated as a result of this practice.

2. <u>Injection Well</u>: This inactive injection well is located near the chromium reduction tank west of the main compressor building. The injection well was drilled in 1969 and first used in 1970 for disposal of treated cooling tower blowdown. The well was designed and constructed to discharge wastewater below the uppermost aquifer and into a ground water basin that was determined unsuitable for domestic or agricultural use. The unit did not operate under any Federal or State Agency permits.

   The injection well was drilled to a depth of 550 feet and constructed of a solid steel casing to a depth of 400 feet and a perforated steel casing from 400 feet to 550 feet. Cement grout was poured between the soil formation and the solid steel casing down to a depth of 400 feet.

The use of the injection well was discontinued in 1974 because the permeability of the soil formation surrounding the perforated well casing was reduced to a point where it would not accept the volume of water being disposed. The well was then closed and capped. Ground water monitoring has not been conducted to determine if this waste disposal practice has caused contamination of aquifers above the basin into which wastes were injected.

29. All wells were surveyed, but the known datum was not stated.

30 & 31. None of the operating wells were sounded.

32. These wells were not sounded because of the installed dedicated pumps.

36. None of the wells produced turbid samples. However, samples from MWP-9 and MWP-12 were slightly cloudy.

37. The sampling and analysis plan is followed except for a minor change: the ground water sampling log used in the field is a different version from the one specified in the plan. The field log does not indicate the name of the sampler (which it should). Also the weather condition is not recorded on the log and it should be so indicated in the log. The following recommendation is made in regard to well sampling:

1. The calibration of pH meter and specific conductance meter should be done twice instead of once during the day. The first calibration should be in the morning and the second calibration during the afternoon. This should be done to offset the possible affects of higher afternoon temperature on the performance of the meters.

2. The sampler should check for head space in the sample bottles for TOC and TOX for all the wells.

3. The sampler should transfer the completed sample bottles immediately to the ice chest instead of letting them stand outside the chest until all sample bottles are done.

40. See comment on item No. 39.

42. The samples should be collected immediately after pumping, not waiting too long (i.e. more than 2 hours) for the wells to recover.

43. Filtration was not done in the field.

44. Samples were placed on ice in the ice chests.

45. EPA recommended sample holding period requirements are observed.

46. Suitable container types are being used.

47. The chain of custody control procedure is defined and has been carried out.

48 & 49. Brown and Caldwell's Emeryville Laboratory performs all analyses for the discharger. Split samples were analyzed by Southern California Laboratory Section of DHS in Los Angeles. The split samples were analyzed for:

1. Hexavolent Chromium (in field) Total Chromium (in laboratory)
2. Total Organic Carbon (TOC)
3. Total Organic Halogens (TOX)
4. pH
5. Total Dissolved Solids content
6. Chlorides
7. Sulfates
8. Total Phosphate as Phosphorus
9. Iron
10. Manganese
11. Sodium
12. Calcium

53. Parameters measured by the discharger in the field were pH, specific conductance and temperature. Results of analyses are included in Appendix L (See also Appendix M).

54, 55 & 56. Field activity logs are filled out as samples are collected. Names and position of the field personnel are not included in the field logs. Names are included in the Chain of Custody record.

57. The analysis program follows EPA guidelines.

58. All record keeping requirements have been met except for

(1) Site weather conditions
(2) Outline of ground water assessment program

59. (a) Ground water Sampling and Analysis Plan

(b) Construction, Development and Sampling of Topock Compressor Station RCRA Ground Water Monitoring Wells - August 1, 1986.

(c) Background Soil Sampling and Analyses, Compressor Station Area; Closure of the Hazardous Waste Management Facilities, Topock Compressor Station, Needles, California, by Mittelhause Corporation, December 1988.

(d) Bat Cave Wash Soil Investigation, Topock Compressor Station; by Brown and Caldwell, October 1988.

(e) Sediment Sampling and Analyses for Percolation Bed and Bat Cave Wash; Topock Compressor Station, by Brown and Caldwell, September 1986.

61. There is no indication of seepage from any of the four surface impoundments. DHS is currently investigating a portion of the Bat Cave Wash and the percolation bed for indications of chromium contamination of the soil and possibly the ground water. The current ground water monitoring system is deficient because of the following:

(a) Geology and hydrology of the ponds site is not adequately defined. The question of the uppermost aquifer is still not fully resolved. The hydrology and geology around MWP-8 is not sufficiently understood. The spatial distribution of the uppermost aquifer beneath the impoundments is not defined.

(b) Values for hydraulic conductivity, speed and precise direction of ground water flow have not yet been determined.

(c) Monitoring well MWP-9 is not a true downgradient well, but rather a side gradient well.

(d) MWP-10 alone appears to be a true downgradient well, since MWP-8 may possibly not be screened in the same aquifer as MWP-10.

(e) It appears that the number of downgradient wells is not enough even though an adequate number cannot be specified at this time because of a lack of a sufficient hydrogeologic information.

To date the discharge has not demonstrated that the resistance grid leak detection system beneath the surface impoundments is adequately functional.

62. A more detailed technical evaluation is not required until the discharger has conducted a detailed hydrogeologic investigation.

Signature of Reviewer

MOHAMMED KHAN
Staff Engineer

APPENDIX C

Figure 1

Location of the Topock Compressor Station

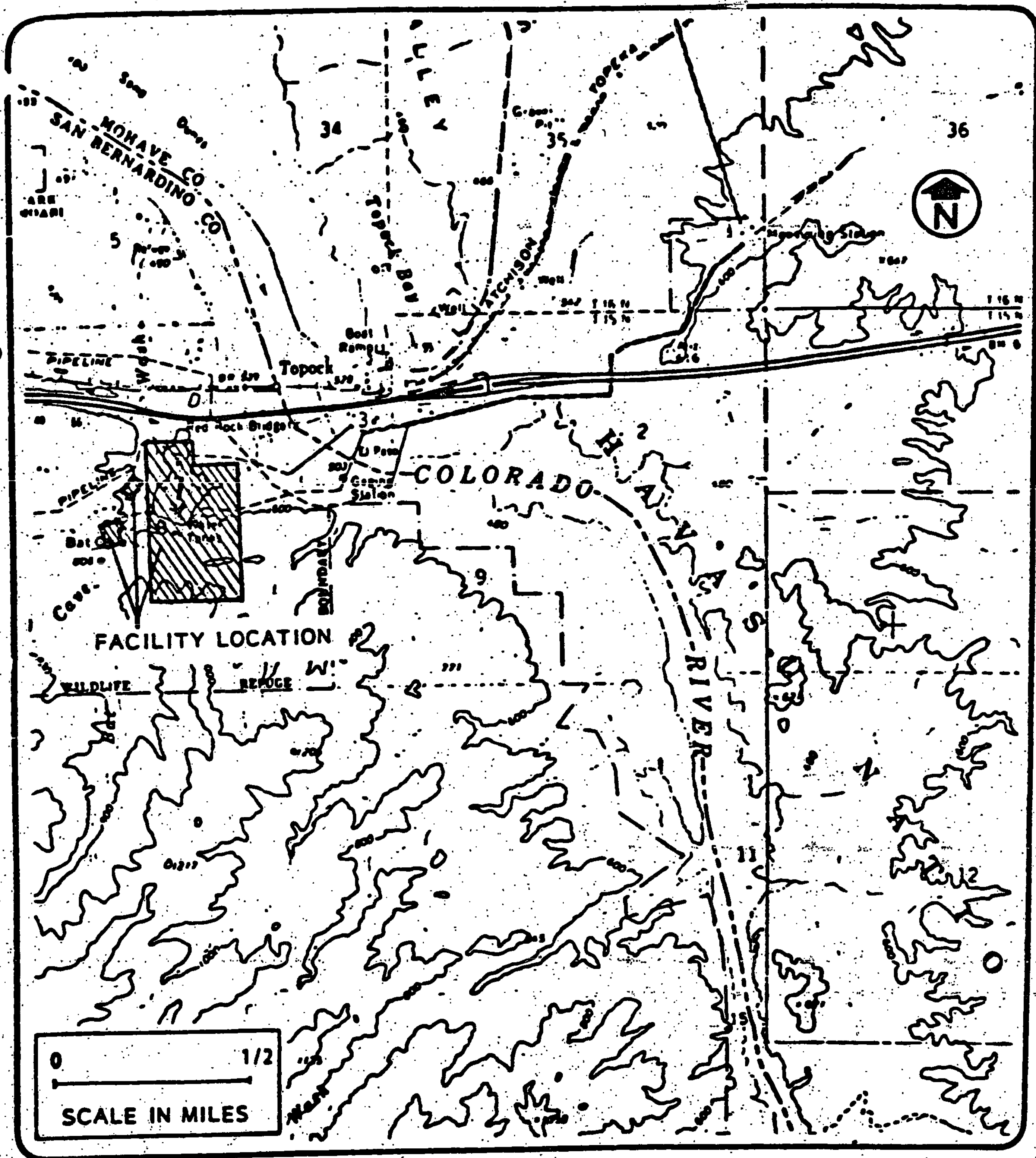


Figure 1

REGIONAL LOCATION OF THE TOPOCK COMPRESSOR STATION
Source: USGS 7.5' Quad
Topock AZ-CA, 1970.

APPENDIX D

Figure 2

Location of Topock Compressor Station Evaporation Ponds

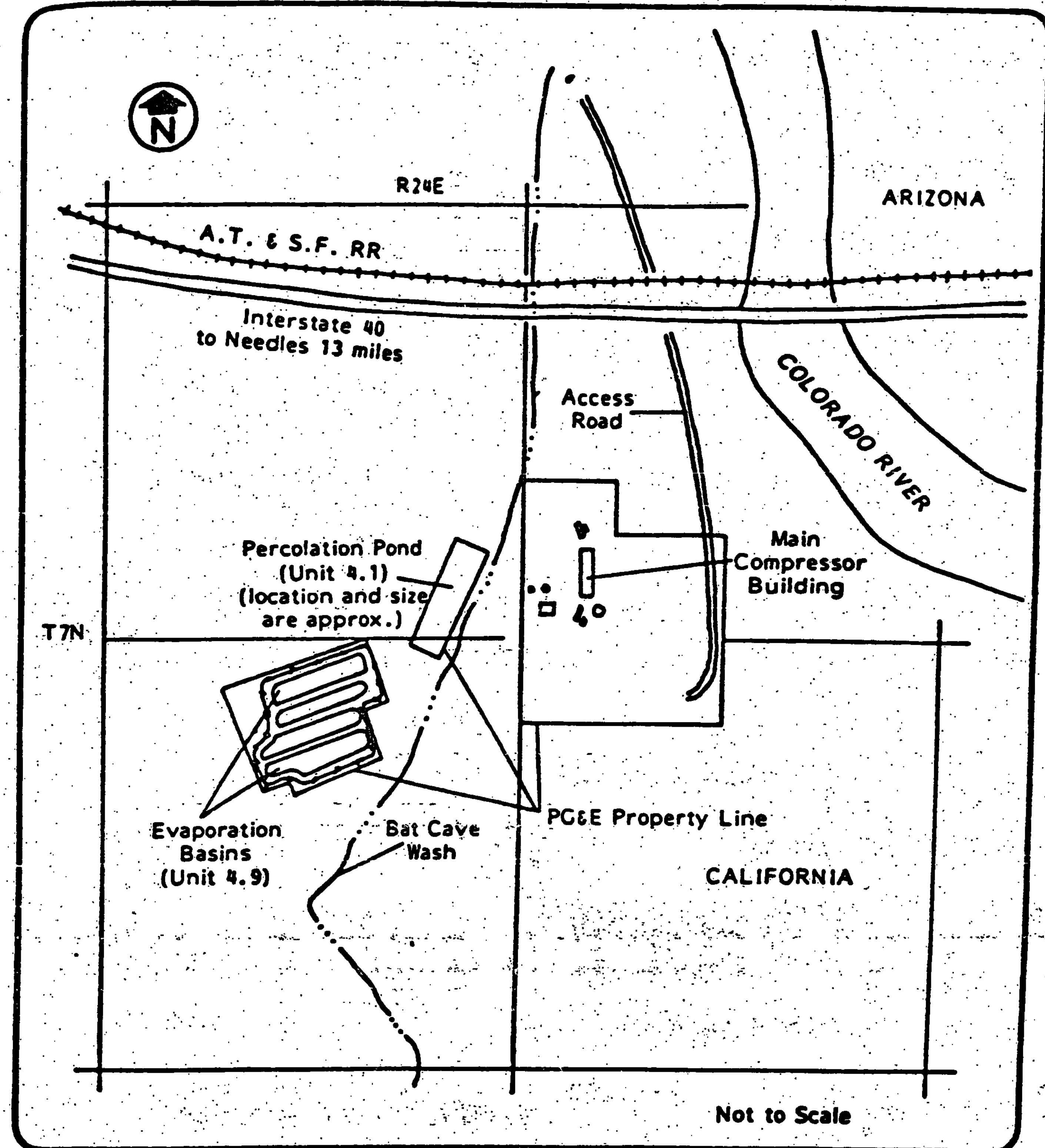


Figure 2

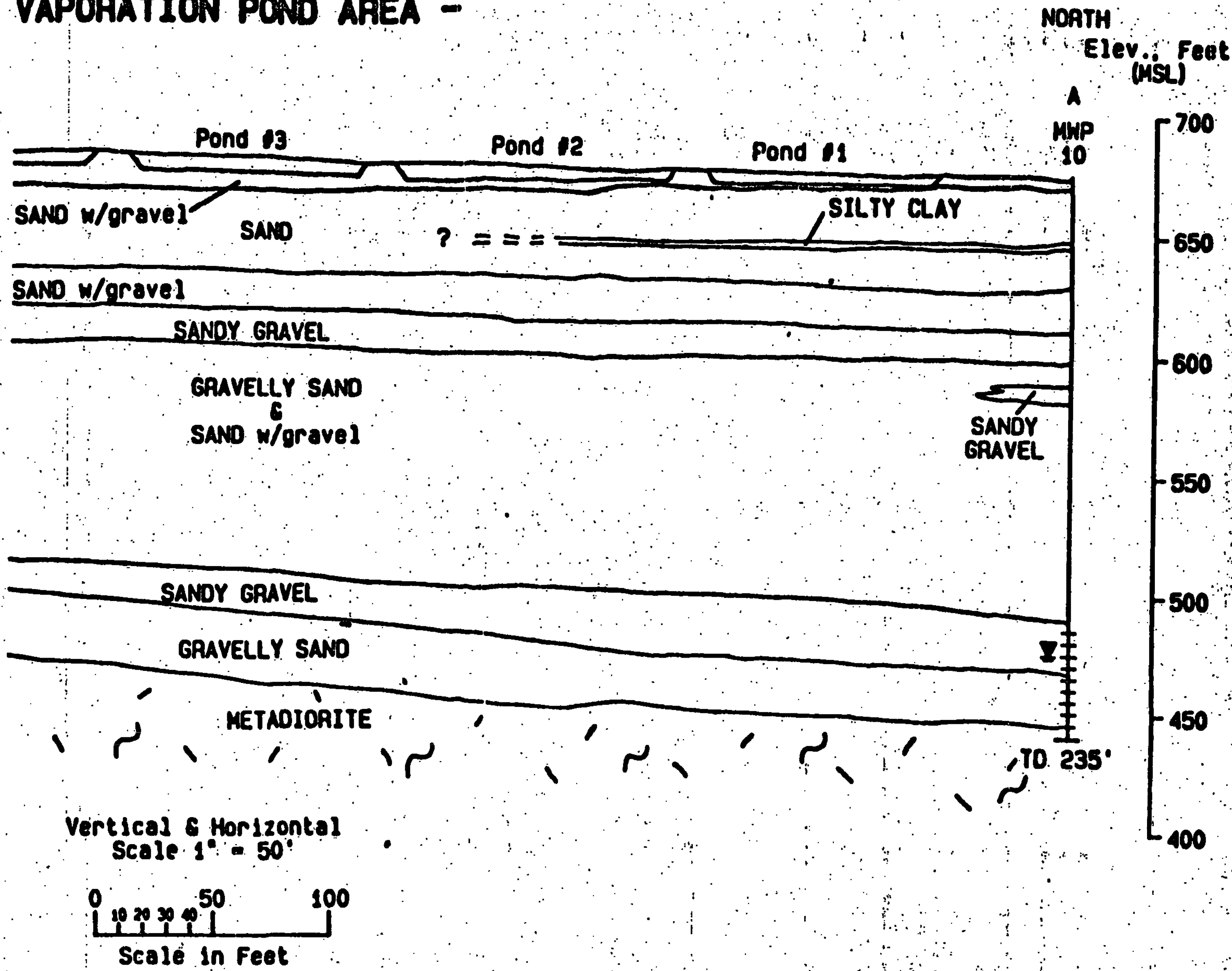
Location of Topock Compressor Station Evaporation Ponds

APPENDIX E

Figures 3 & 4

Geologic Cross Sections

DCK COMPRESSOR STATION
VAPORATION POND AREA -

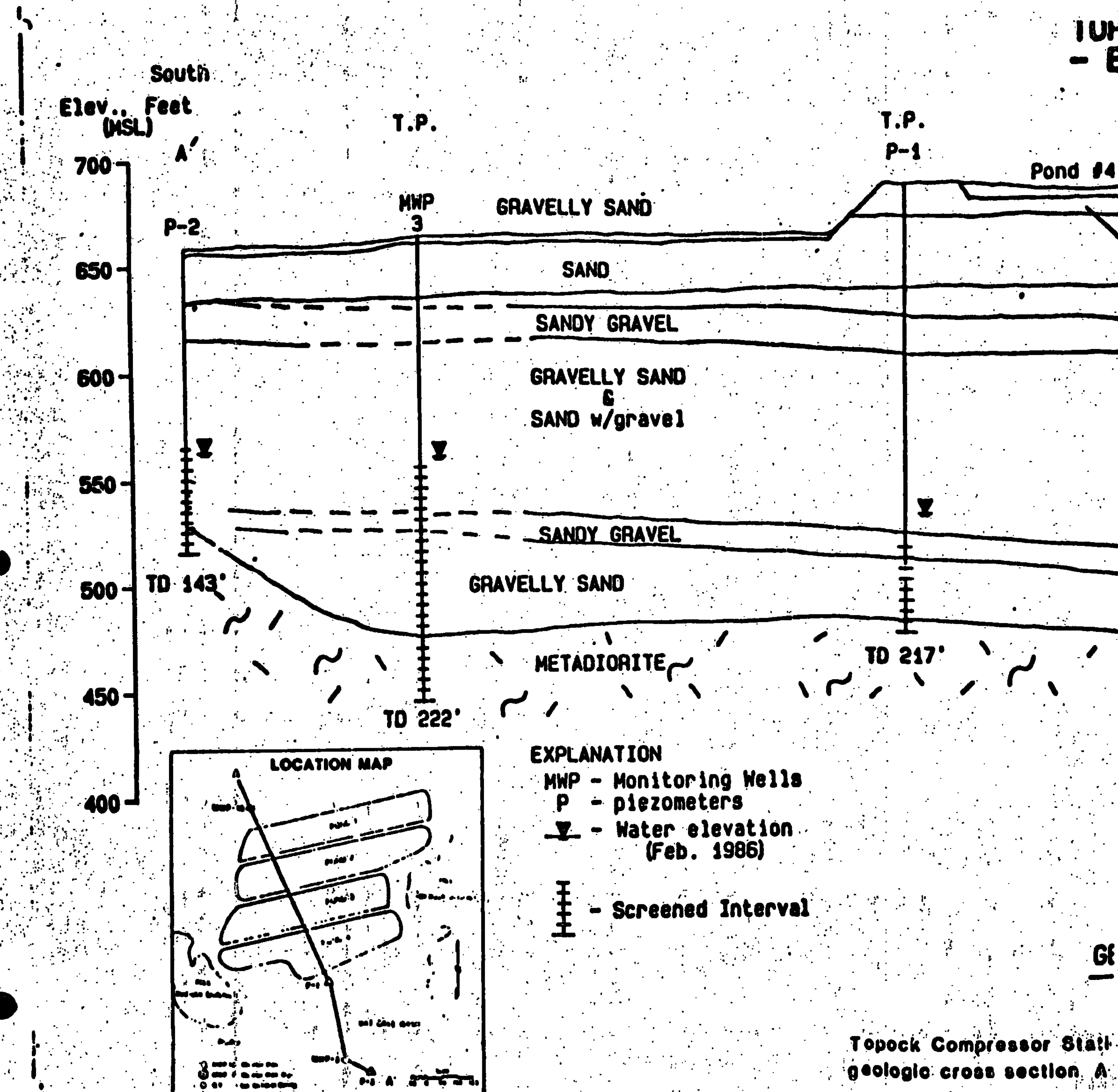


:OLOGIC CROSS SECTION A-A'

ɔn, evaporation pond waste management area showing the North-South ·A' through selected upgradient and down gradient wells.

FIGURE 3

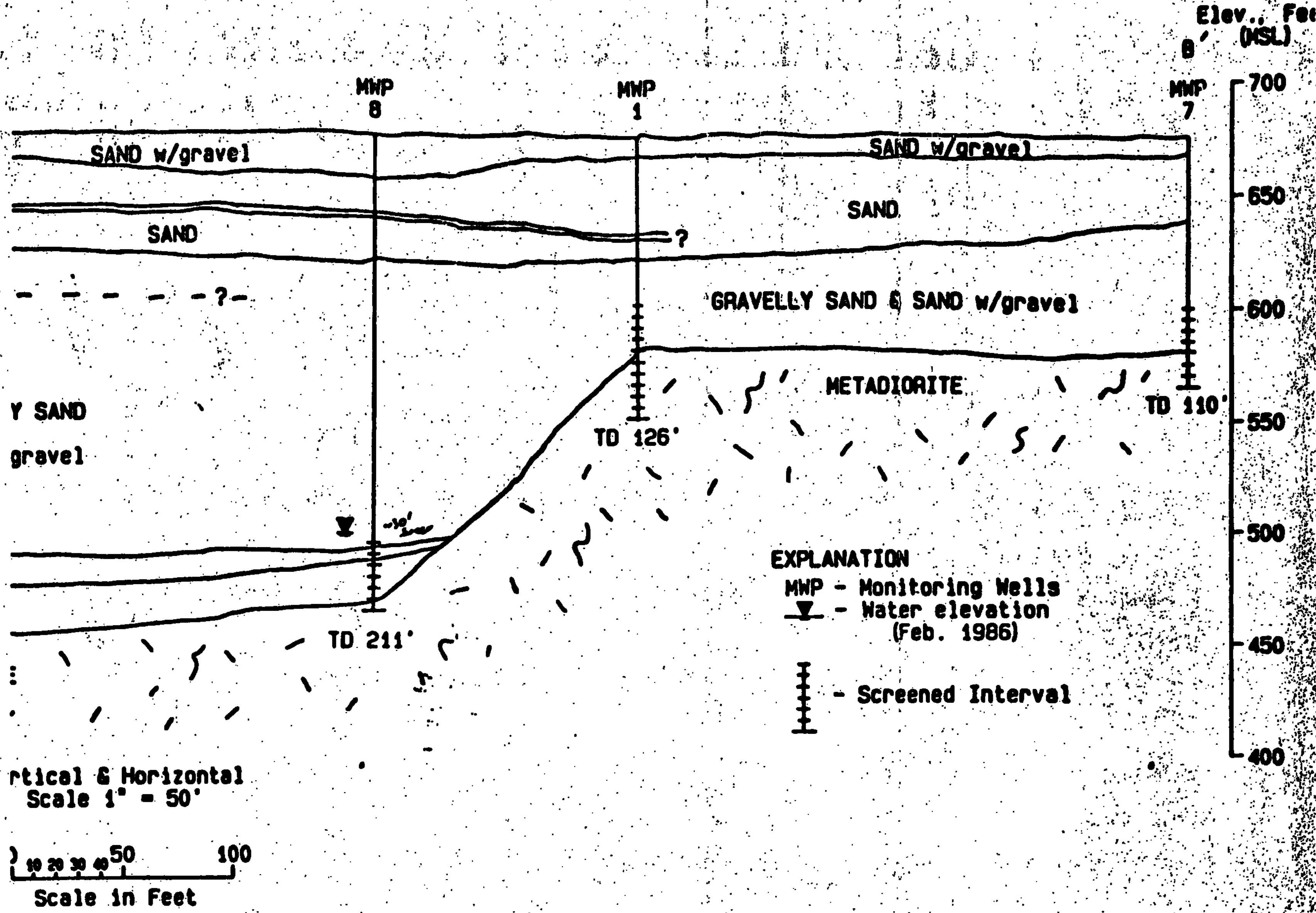
IUP
- E



GE

Topock Compressor Stati
geologic cross section A

COMPRESSOR STATION
RATION POND AREA -



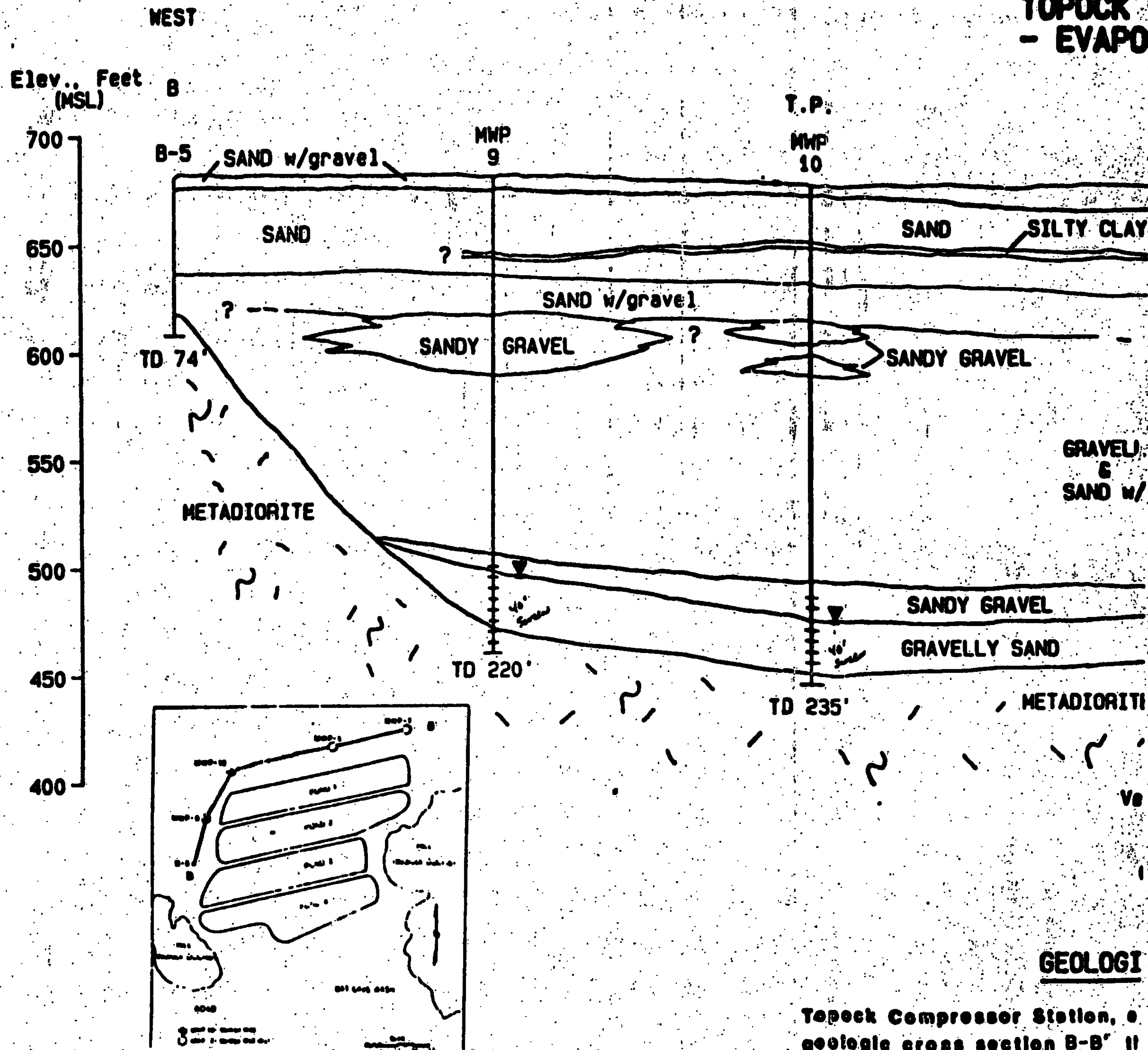
C CROSS SECTION B-B'

raporation pond waste management area showing the East-West

wells and borings.

FIGURE 4

TOPOCK
- EVAPO



GEOLOGI

Topock Compressor Station, e
geologic cross section B-B' II

APPENDIX F

Figure 5

Basement Contour Map for Topock Compressor Station's Evaporation Pond Area

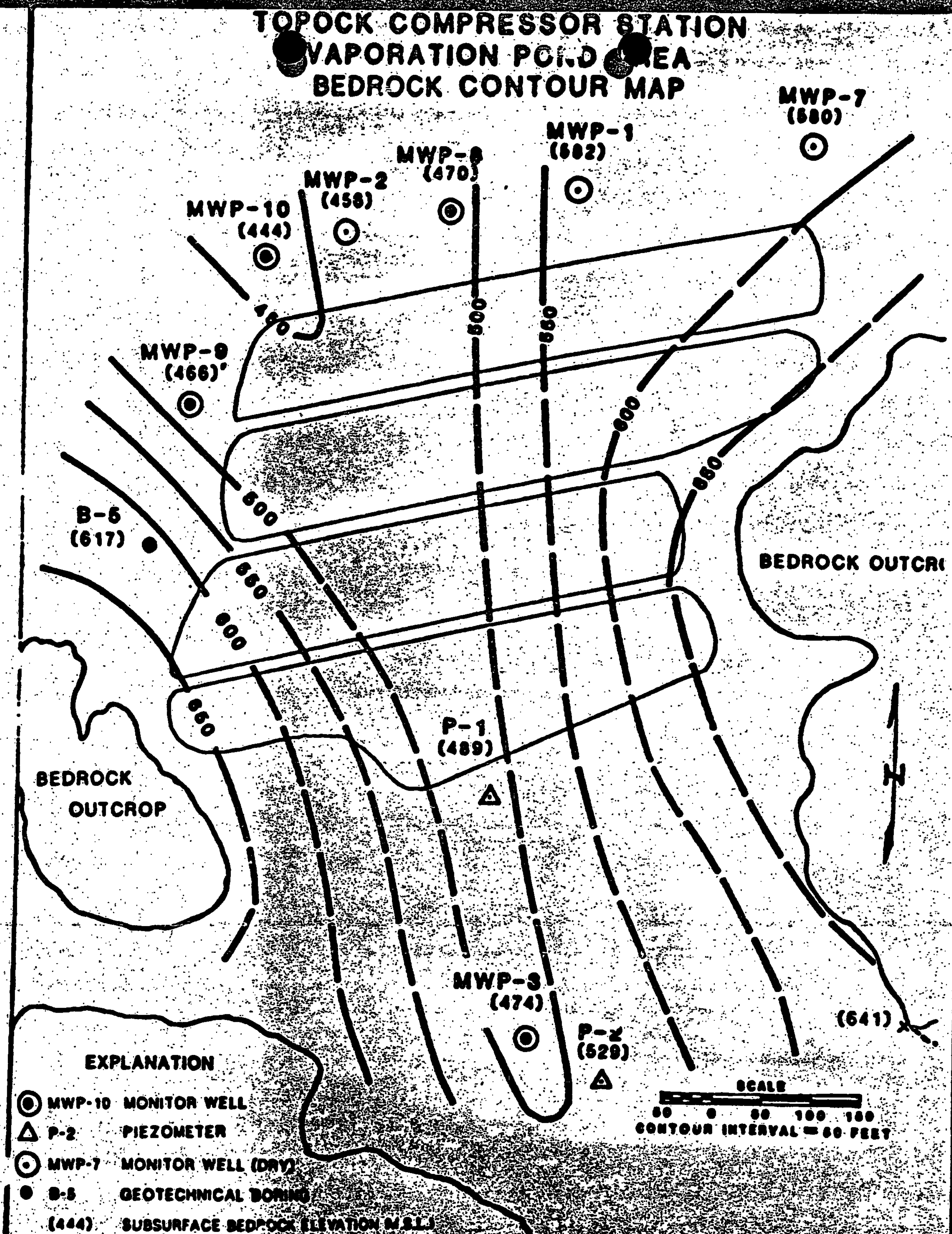


FIGURE 5 Basement contour map for Topock Compressor Station, evaporation pond area

APPENDIX G

Figure 6

Topock Compressor Station Evaporation Pond Area

Showing Location of RCRA Ground Water Monitoring Wells, Piezometers and Geotechnical Borings

TOPOCK COMPRESSOR STATION EVAPORATION POND AREA BORING LOCATION MAP

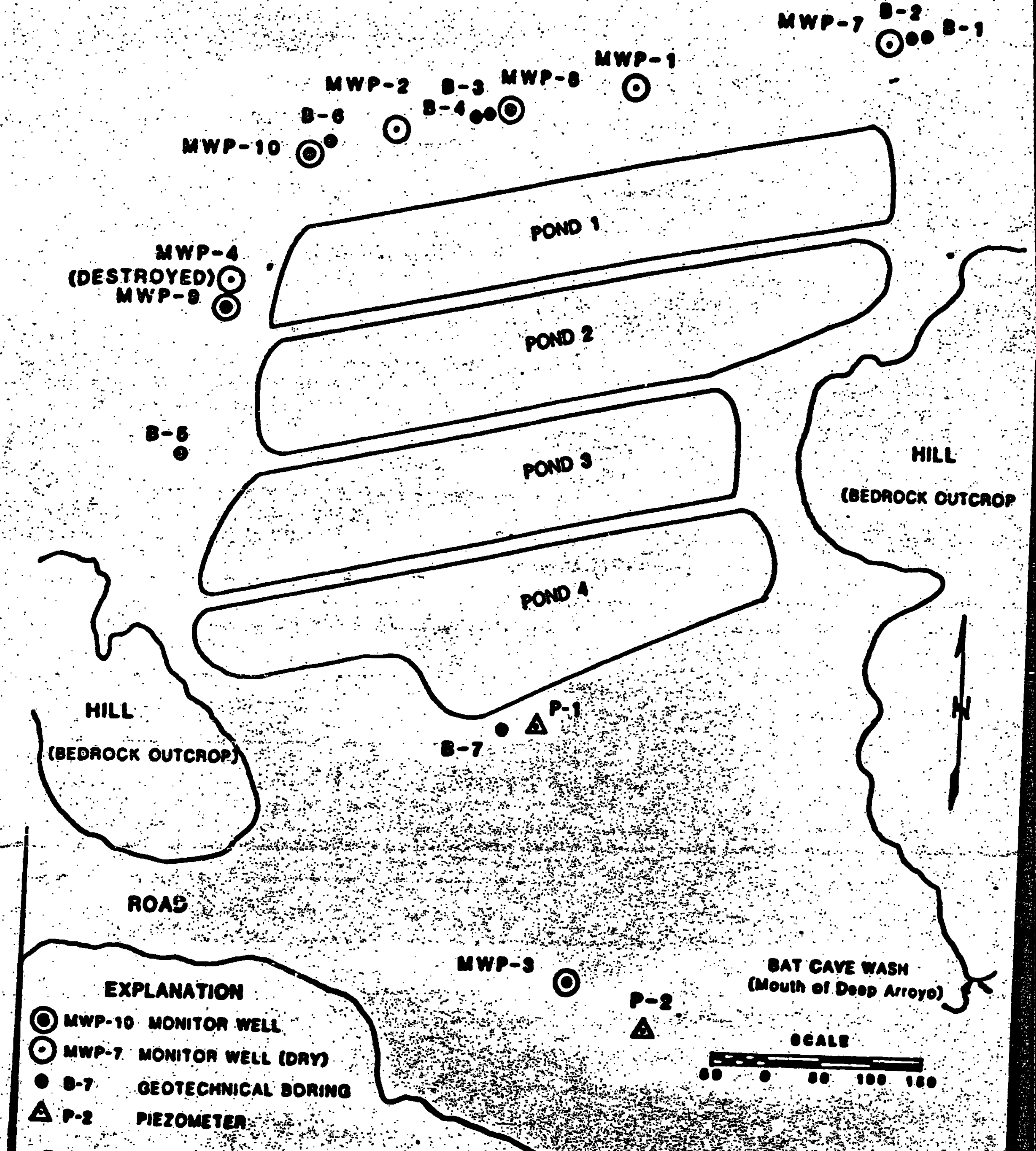


FIGURE 6 Topock Compressor Station evaporation pond area showing the locations of the RCRA groundwater monitoring wells, piezometers, and geotechnical borings

APPENDIX H

Figure 7

Topock Compressor Station Evaporation Pond Area
Water Level Contour Map

TOPOCK COMPRESSOR STATION EVAPORATION POND AREA WATER LEVEL CONTOUR MAP

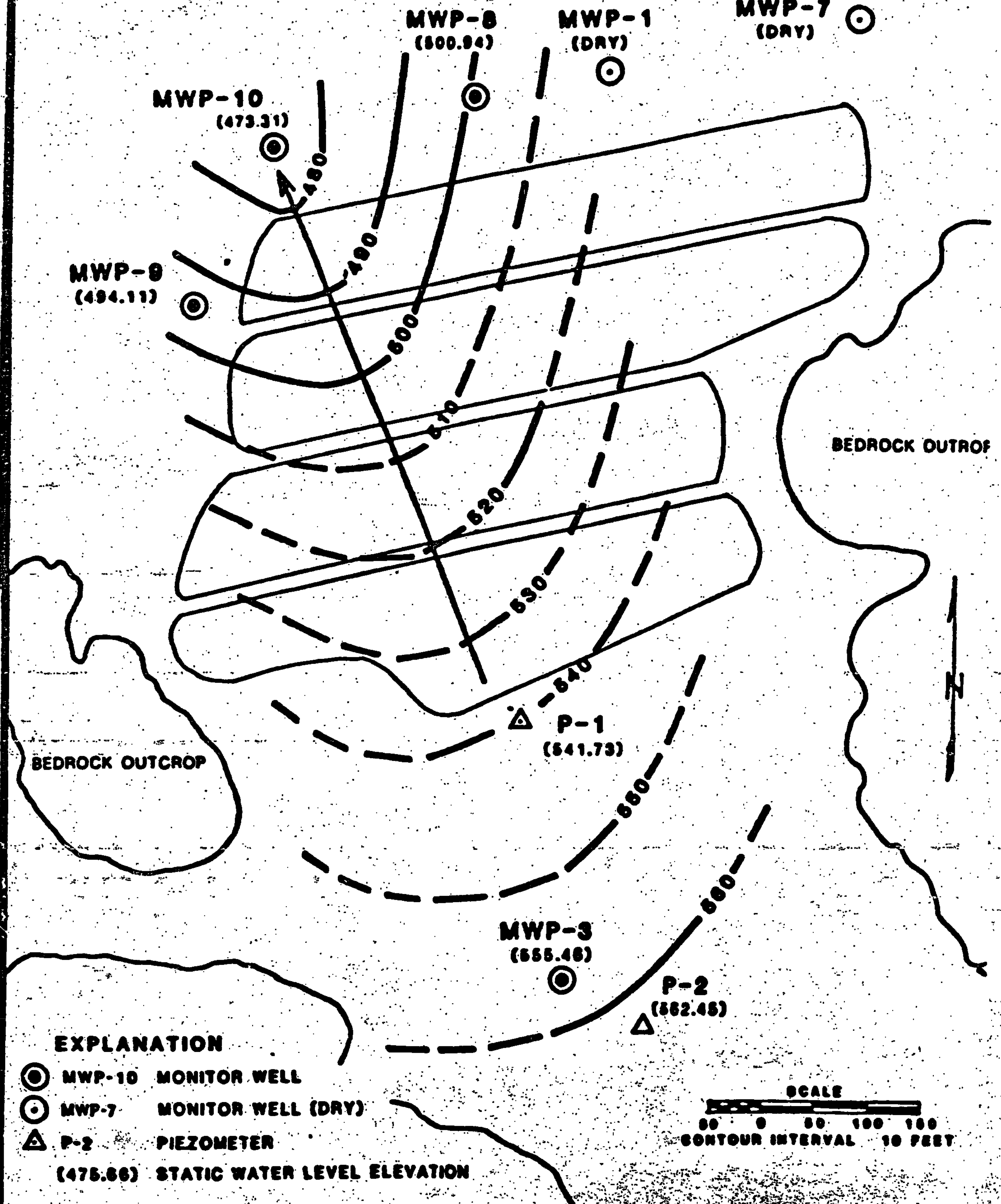


FIGURE 7 Water level contour map constructed from March 24, 1986 data, Topock Compressor Station, evaporation pond area

APPENDIX I

Figure 8

Topock Compressor Station Evaporation Ponds
and
Ground Water Montioring System

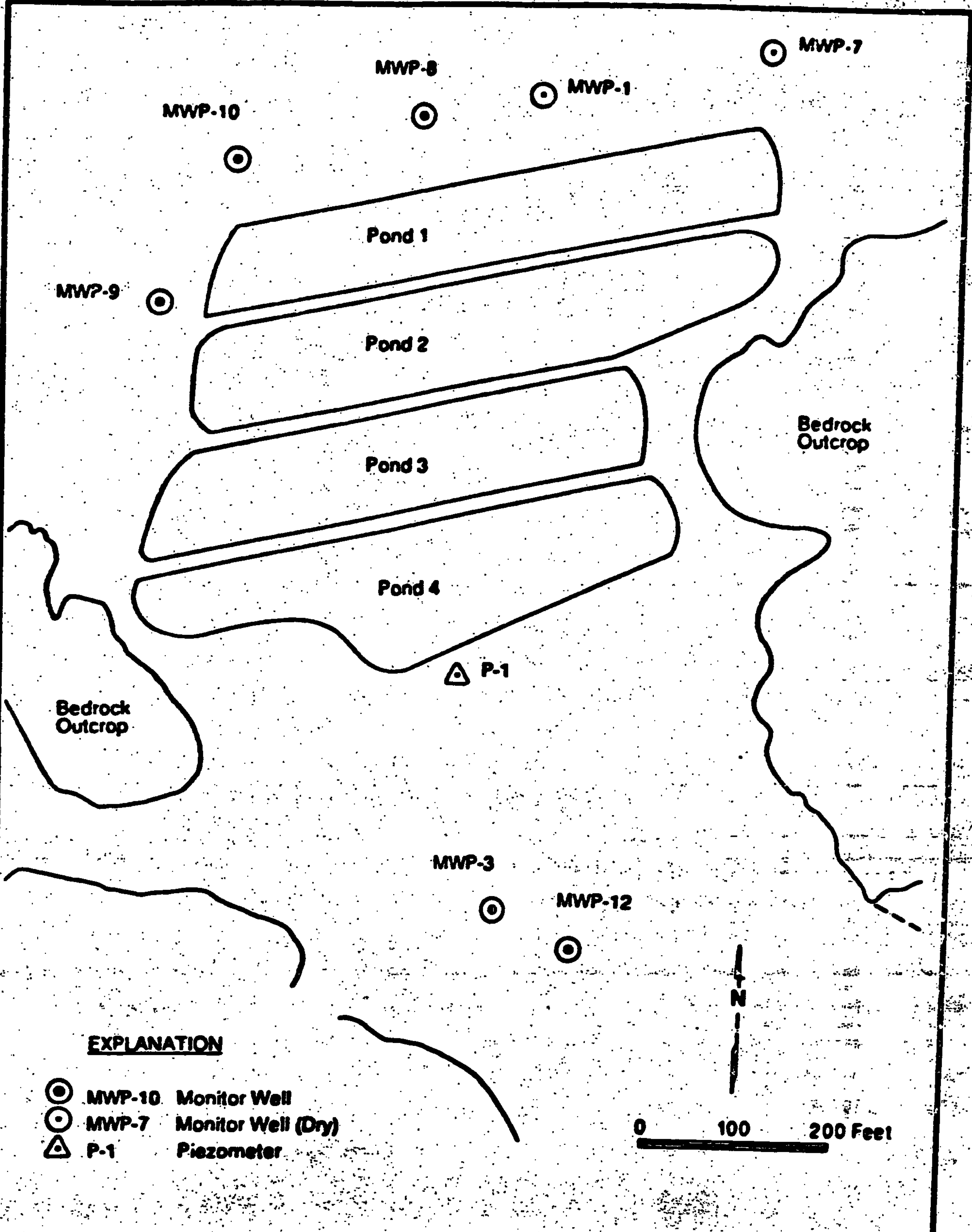


FIGURE 8 Topock Compressor Station evaporation ponds and ground-water monitoring system.

APPENDIX J

Bore Hole Logs
and
Well Construction Record

Table 1. Well Construction Data

Well Number	Screened Interval (feet)	Well Total Depth (feet)	Borehole Total Depth (feet)	Depth to Bedrock (feet)	Top of Casing Elevation (feet)	Grou[illegible] Surf. Eleva[illegible] (fee[illegible]
MWP-3	108-208	218	222	188	662.34	661.[illegible]
MWP-8	181-211	211	211	205	676.26	675.[illegible]
MWP-9	179-219	219	220	215	582.12	581.[illegible]
MWP-10	194-234	234	235	230	674.59	673.[illegible]
P-1	171-211	211	217	205	695.76	694.[illegible]
P-2	96-136	136	143	130	662.30	660.4

All wells constructed of 3-inch diameter Schedule 80 PVC pipe and slotted casing. Slot size 0.010 inch.

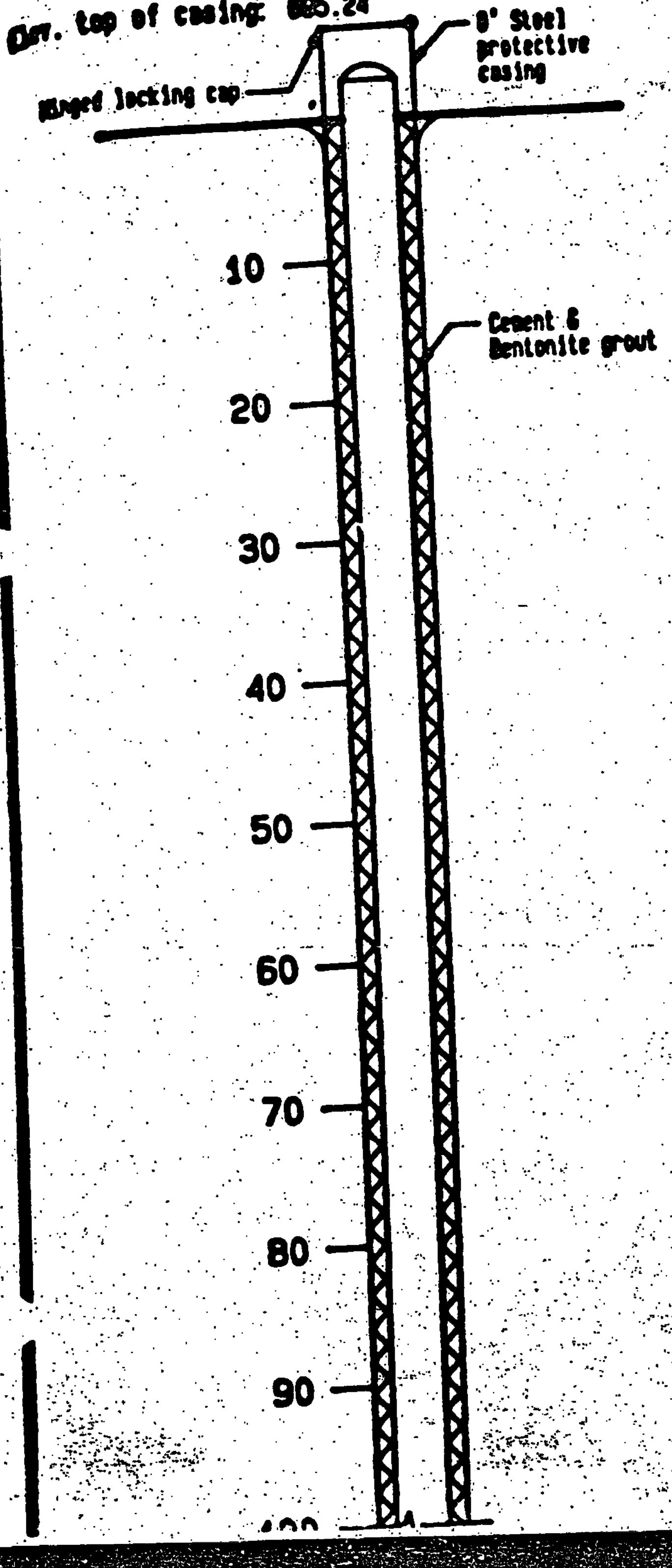
Top of casing elevations measured from top of Well Wizard mounting plate

BORE HOLE LOGS AND WELL CONSTRUCTION RECORD
TOPOCK COMPRESSOR STATION

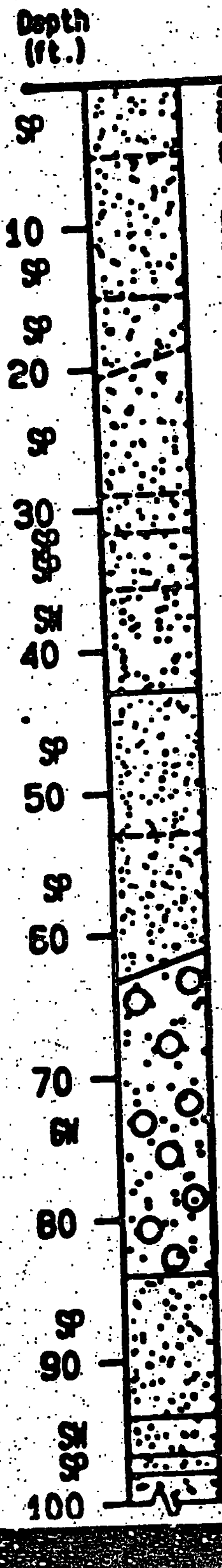
BORE HOLE (P-1.)

DATE STARTED 2/2/86

WELL AS-BUILT



DESCRIPTION OF MATERIALS



SAND w/gravel - Brn, VF-F gr, sl moist, Subang to subrdd, calc. w/Metadiorite & gneissic gravels to 2".

GRAVELLY SAND - Gray brn, VF-M gr, dry, calc. subang to subrdd, w/gravels to 3".

SAND w/gravel - Rd brn, VF-F gr, sl moist, calc. w/gravels to 2".

SAND - Rd brn, VF-F gr, sl moist, subrdd to rdd, uniform texture.

SAND w/gravel - (As above, w/gravel to 2".)

SAND - Rd brn, dry (as before).

SAND w/gravel - Rd brn, VF-C gr, dry, subrd to rdd, w/subrdd meta. gravels to 2".

SAND - Rd brn, VF gr, moist, subang, calc. Uniform texture.

SANDY w/gravel - Brn, VF-M gr, moist, Subang to subrdd, calc., w/subang to to subrdd meta. gravels to 3".
- increasing gravels & decreasing moisture

SANDY GRAVEL - Gray brn, VF-C gr, subang, sl moist sand matrix w/meta. gravels to 3"

GRAVELLY SAND - Rd brn, VF-M gr, dry, calc Subang to subrdd w/subang meta. gravels to 3".
- sl moist zone -

SAND w/gravel - (As above, less gravel.)

SAND - Rd brn, VF-F gr, sl moist, uniform

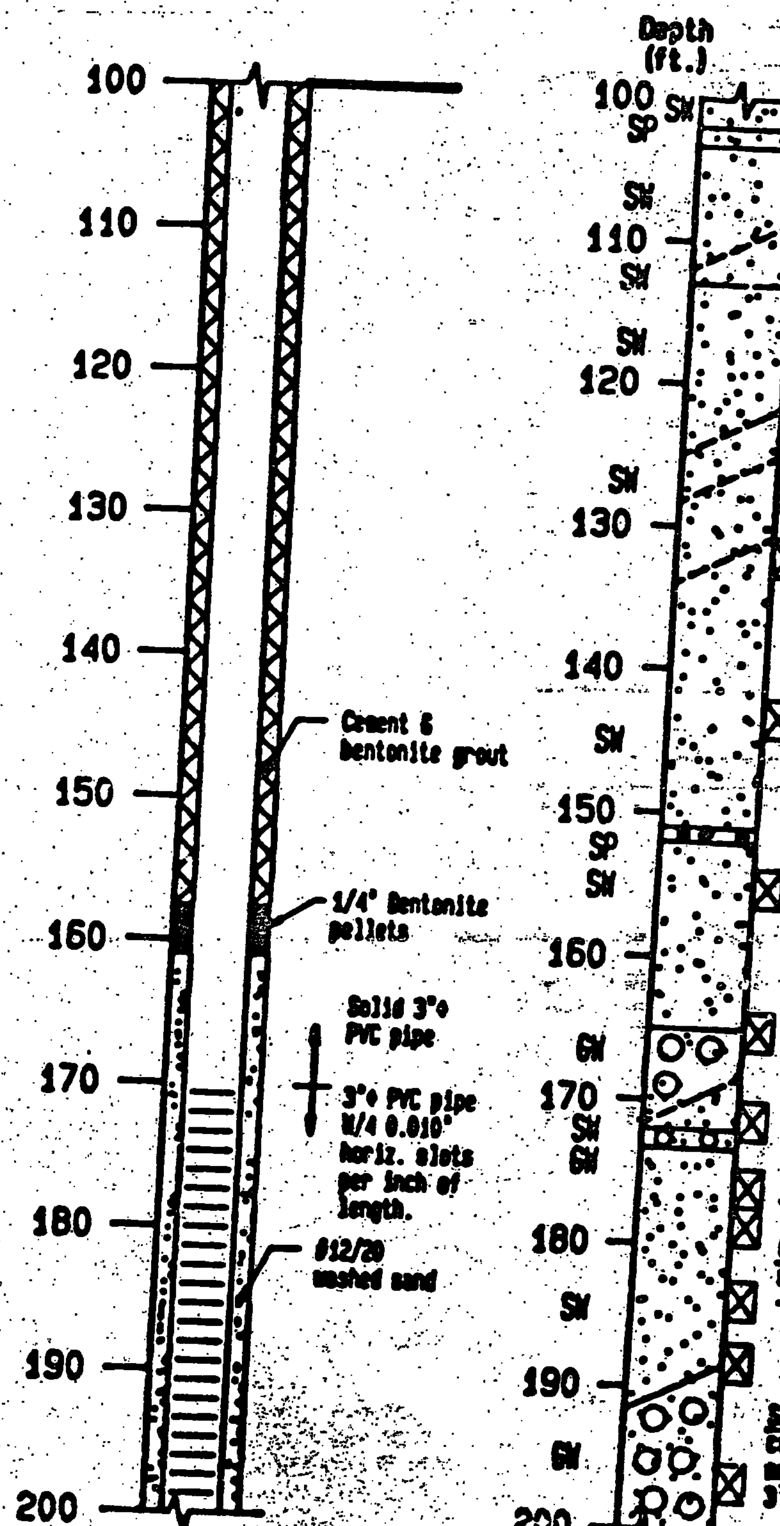
BORE HOLE LOGS AND WELL CONSTRUCTION RECORD
TOPOCK COMPRESSOR STATION

BORE HOLE P-1 CONT'D

DATE STARTED 2/2/86

WELL AS-BUILT

DESCRIPTION OF MATERIALS



SAND w/gravel - Brn. VF-C gr. dry. subang to subrdd. w/gravels to 2".

SAND- Red brn. VF-F gr. sl. moist. uniform.

SAND w/gravel- Gray brn. VF-C gr. dry. calc. subang to subrdd. w/meta gravels to 3".

GRAVELLY SAND- (As above, more gravel).

SAND w/gravel- (As before).

GRAVELLY SAND- Gray brn. VF-C gr. dry. subang to subrdd calc. w/meta gravels to 3".

SAND w/gravel- (As above, less gravel).

GRAVELLY SAND- Brn. VF-C gr. sl. moist subang to subrdd. calc. w/subang to subrdd meta gravels to 2 1/2".

GRAVEL- COBBLE layer.

GRAVELLY SAND- (As before).

SANDY GRAVEL- (As above, more gravel) cobble layer at 169'.

GRAVELLY SAND- Brn. F-C gr. subang to subrdd. wet (at 171') dry otherwise.

GRAVEL- COBBLE layer.

GRAVELLY SAND- Brn. F-C gr. wet, calc.. subang w/meta & SFF gravels to 2" -decreasing moisture-.

SANDY GRAVEL- Pinkish gray. VF-C gr. dry. calc. subang SAND matrix w/qtz. metadiorite & SFF (fanglomerate) to 3" (sparse cobbles to 4").

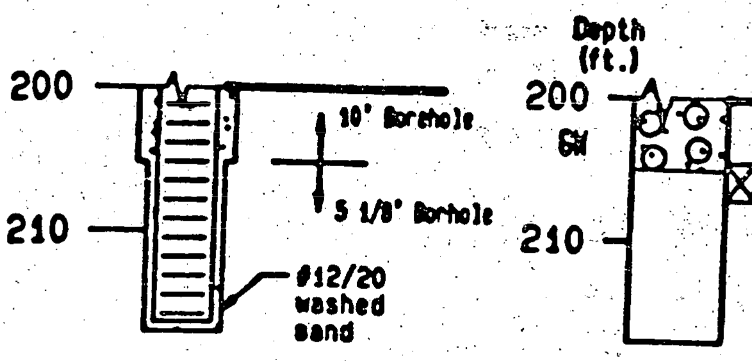
BORE HOLE LOGS AND WELL CONSTRUCTION RECORD
TOPOCK COMPRESSOR STATION

BORE HOLE (P-1) CONT'D

DATE STARTED 2/2/86

WELL AS-BUILTS

DESCRIPTION OF MATERIALS



METADIORITE- Dk green, hard, sl. weathered.

Hole terminated at 217.0'

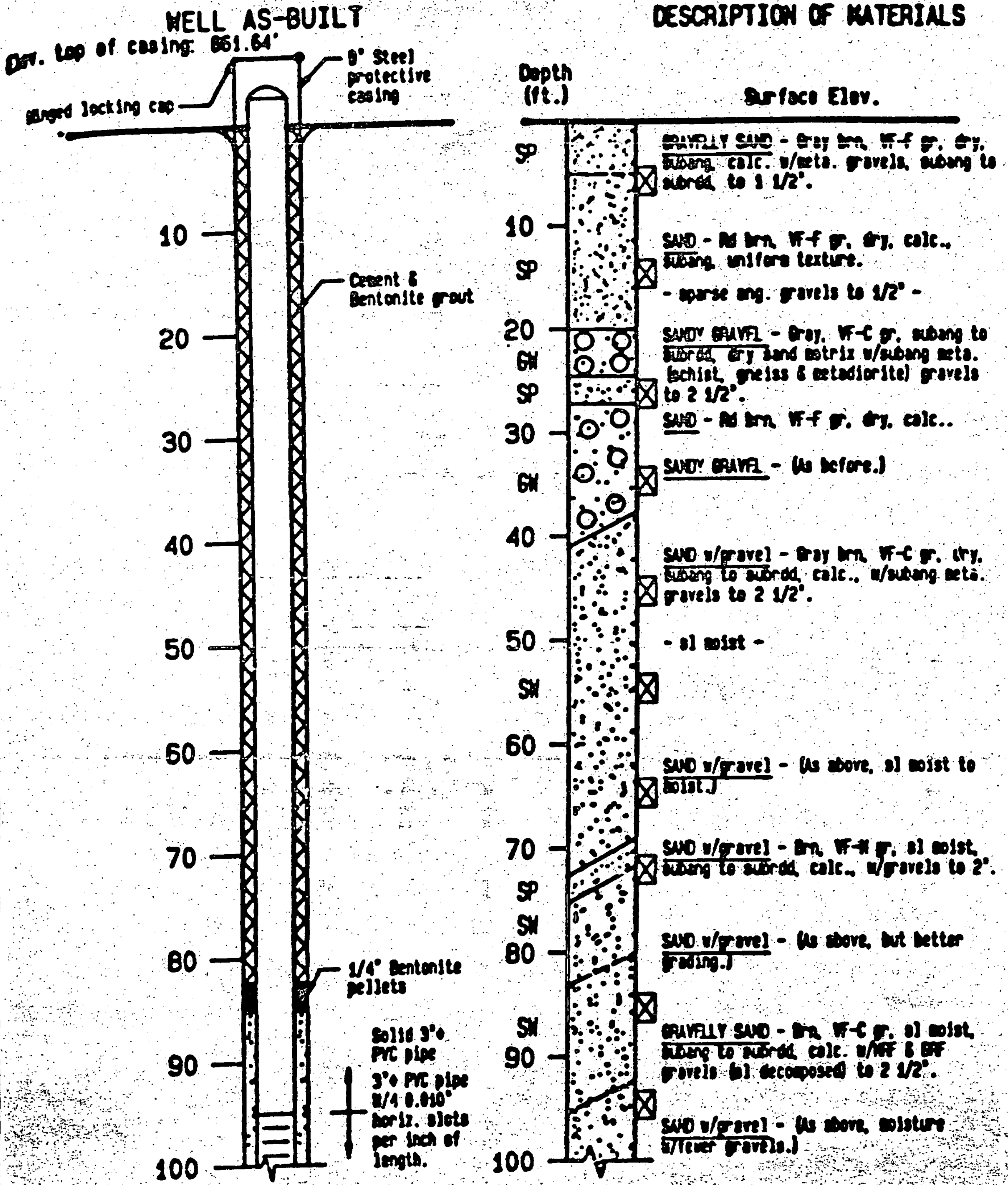
Notes:

1. Hole advanced by Layne-Westerns 10" air percussion hammer & 5 1/ air rotary hammer.
2. Borehole logged by L.A. Flora.

BORE HOLE LOGS AND WELL CONSTRUCTION RECORL
TOPOCK COMPRESSOR STATION

BORE HOLE (P-2)

DATE STARTED 2/5/86

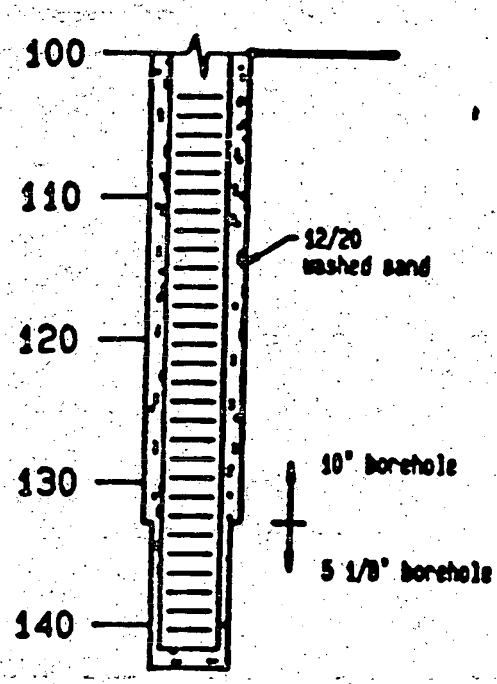


BORE HOLE LOGS AND WELL CONSTRUCTION RECORD
TOPOCK COMPRESSOR STATION

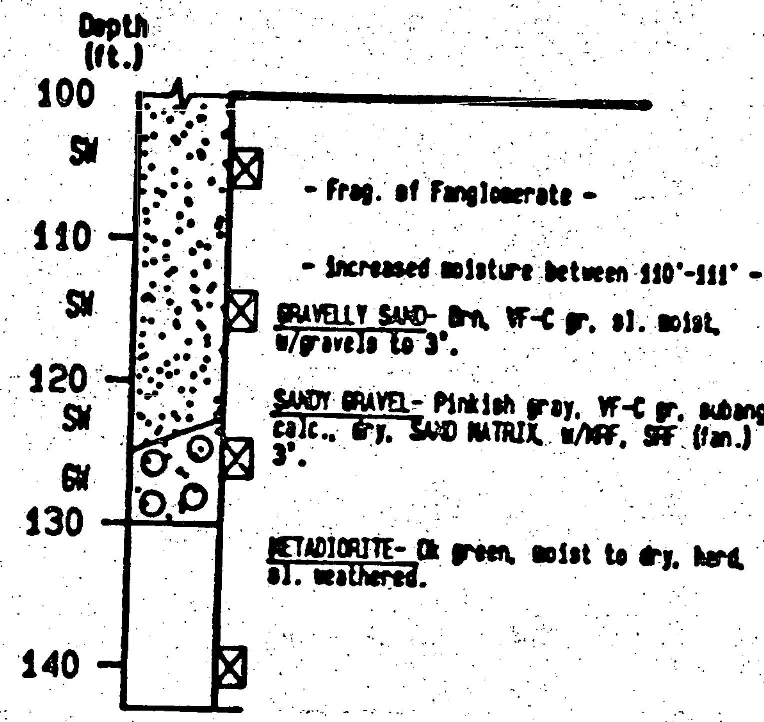
BORE HOLE (P-2) CONT'D

DATE STARTED 2/5/85

WELL AS-BUILT



DESCRIPTION OF MATERIALS



Hole terminated at 143.0'

Notes:

1. Hole advanced by Layne-Westerns 10" air percussion hammer & 5 1/8" air rotary hammer.
2. Borehole logged by L.A. Flora.

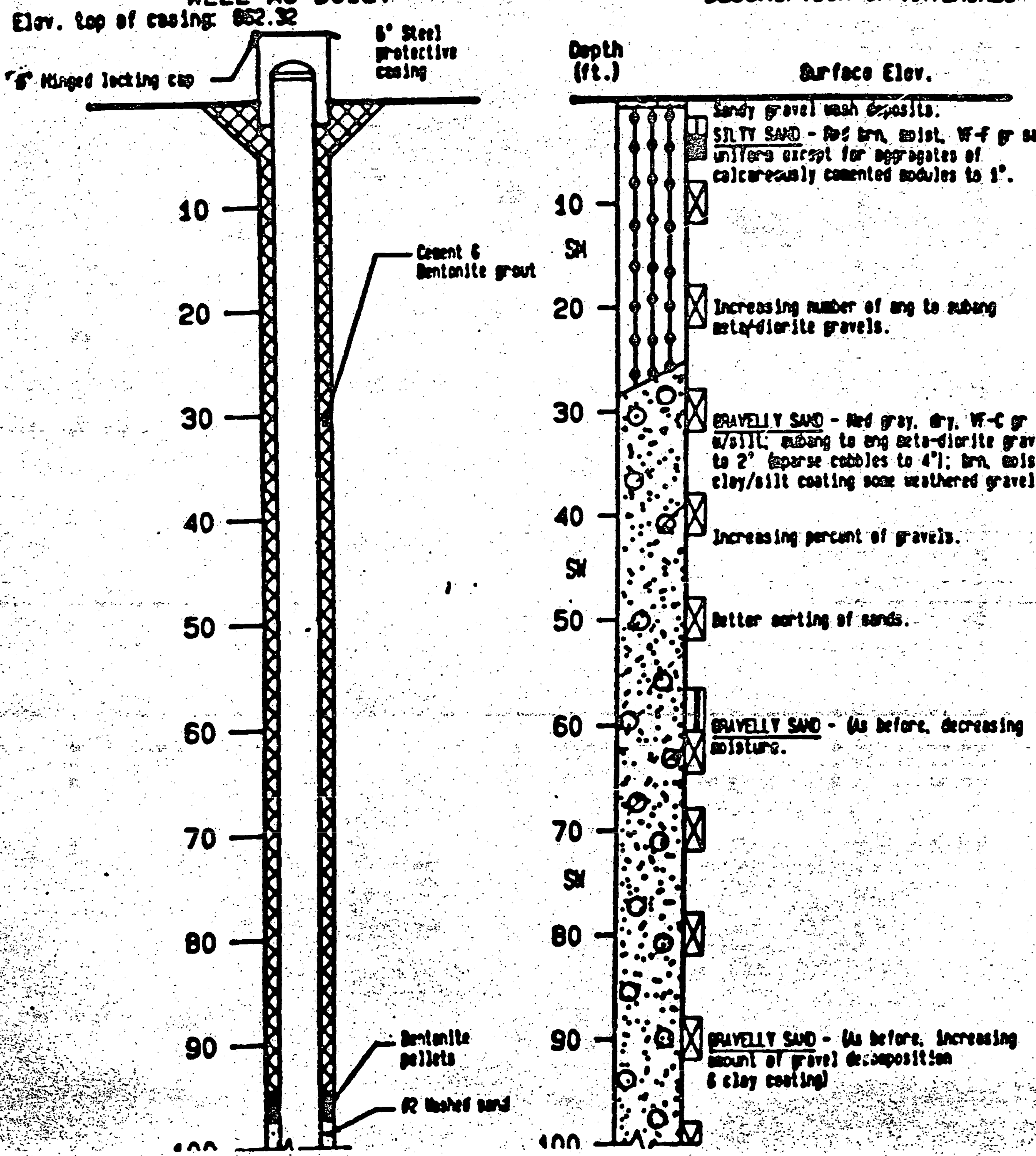
BOREHOLE LOGS AND WELL CONSTRUCTION RECORI
TOPOCK COMPRESSOR STATION

BORE HOLE MWP-3

DATE STARTED 7/21/85

WELL AS-BUILT

DESCRIPTION OF MATERIALS



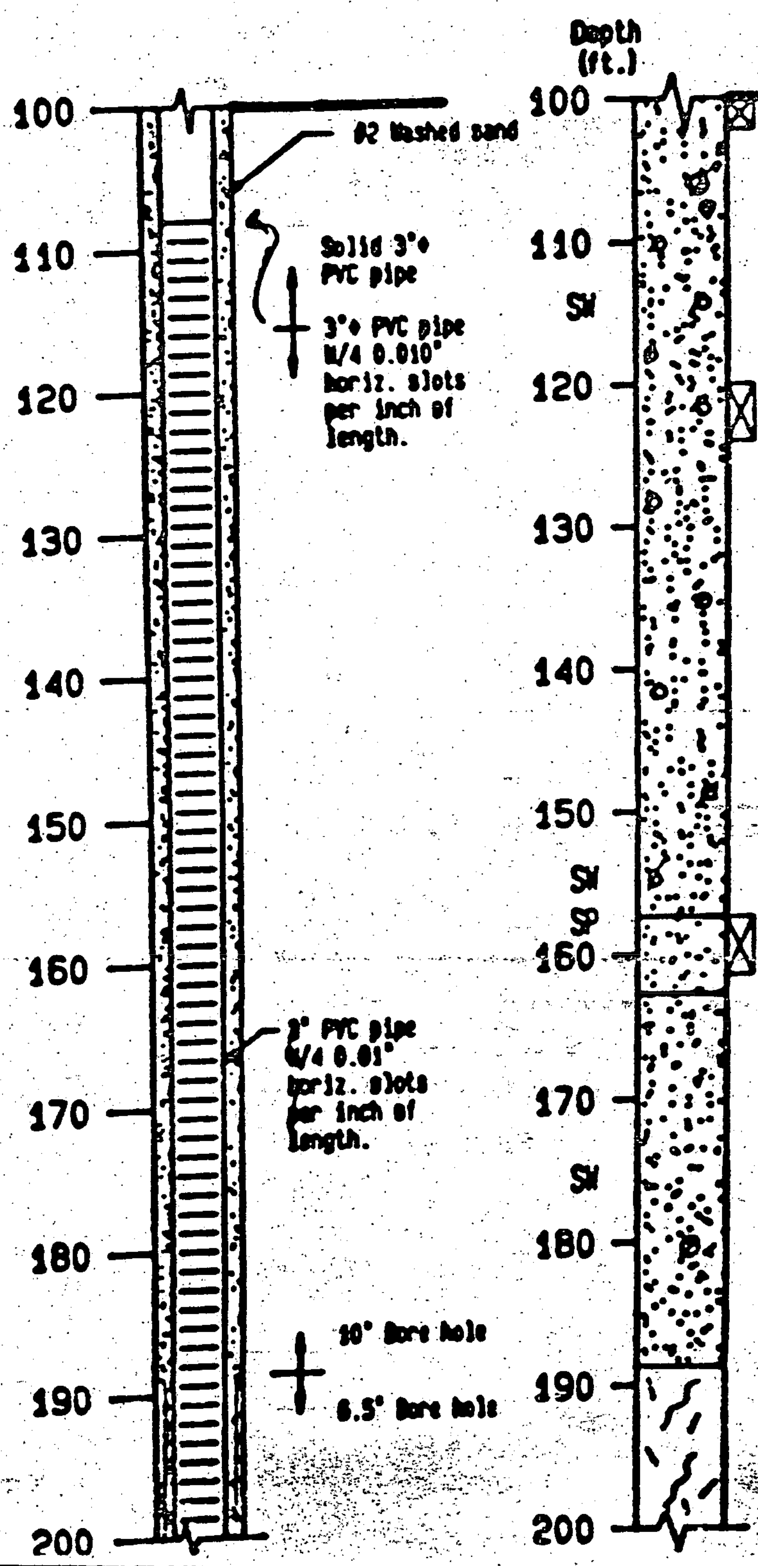
BOREHOLE LOGS AND WELL CONSTRUCTION RECORL
TOPOCK COMPRESSOR STATION

BORE HOLE MWP-3 CONT'D

DATE STARTED 7/21/85

WELL AS-BUILT

DESCRIPTION OF MATERIALS



GRAVELLY SAND - Med. gray, sl. moist to moist, poorly sorted, VF to C gr sand, subrdd to subang w/subang to gov, clay-silt coated gravel to 1".

GRAVELLY SAND - Med gray, wet, VF-C gr w/subang to subrdd gravels to 2"; calcareous - perched water.

GRAVELLY SAND - (As before, decreasing moisture).

GRAVELLY SAND - Med brn, dry, F-C gr sand w/subang clay coated gravels to 1"; calcareous.

SAND - Brn, moist, F gr, fairly unifor texture; spare subrdd gravels to 1/4".

GRAVELLY SAND - Light brn to gray, sl. F-M gr sand w/gravels to 1/2" (some clay coating on gravels).

GRAVELLY SAND - (As before, slightly coarser).

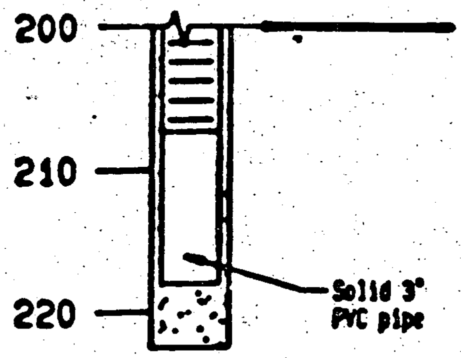
METADIORITE - Dark green, sl. moist & hard, sl. weathered, F-M gr porphyritic texture.

BOREHOLE LOGS AND WELL CONSTRUCTION RECO
TOPOCK COMPRESSOR STATION

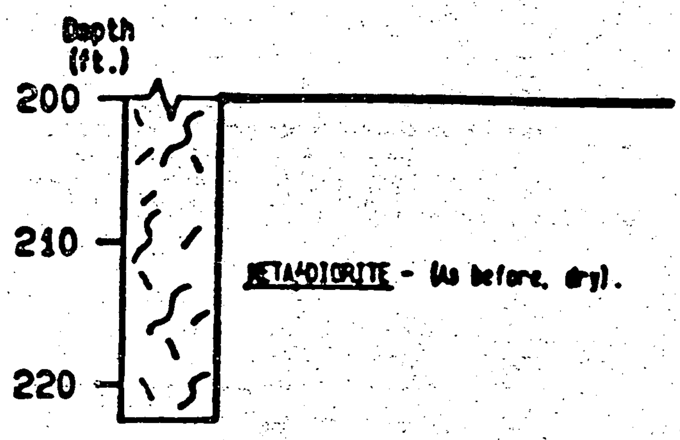
BORE HOLE MWP-3 CONT'D

DATE STARTED 7/21/85

WELL AS-BUILTS



DESCRIPTION OF MATERIALS



Hole terminated at 222.0'

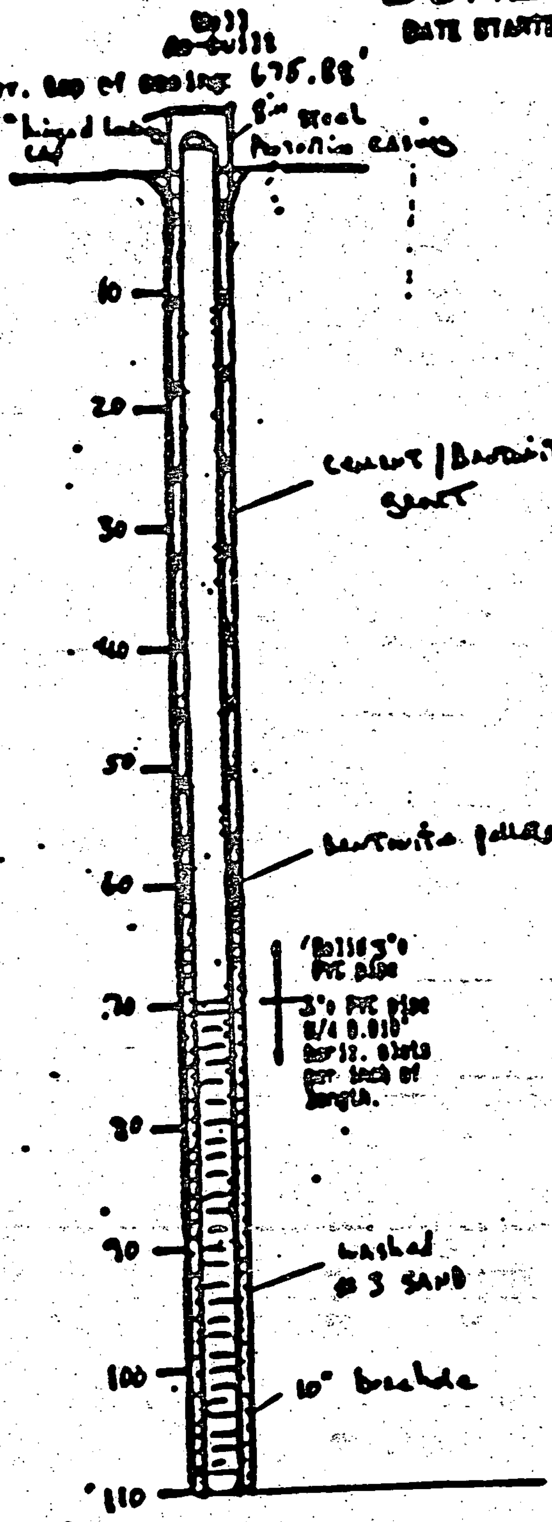
Notes:

1. Hole advanced by Layne-Westerns 10" air percussion hammer rig.
2. Borehole logged by L.A. Flora.

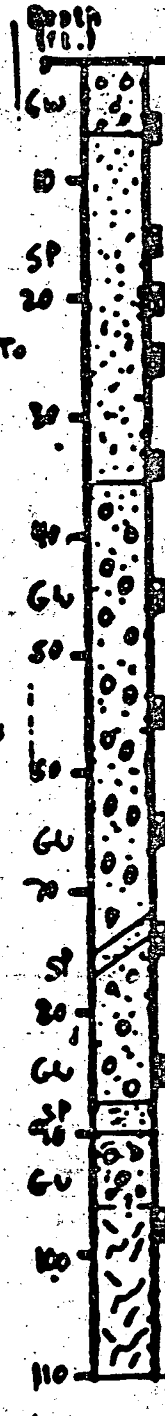
BORE HOLE LOGS AND WELL CONSTRUCTION RECORD

BORE HOLE HLP-7

DATE STARTED 9/20/85



DESCRIPTION OF MATERIALS



SANDY GRAVEL w/SILT – Gray, Dry, poorly sorted; gravels are subang to ang metabasalt & cobbles to 3"

SAND – Reddish Brn, Dry, VF-Fgd, uniform, Sl. calcareous, Subang to Subrd qtz

SAND – (As above)

increasing small gravels

SANDY GRAVEL – Reddish Brn, Dry, calcareous sand w/ subrd to subang meta gravels to 3"

increasing amount of cobbles

SANDY GRAVEL – (As before)

GRAVELLY SAND – Reddish Brn, Dry, w/ subang meta gravels to 3"

SANDY GRAVEL – (As before)

SAND w/ gravel – Reddish Brn, VF-Fgd, Subrd qtz grs; meta. gravels to 3"

SANDY GRAVEL – Gray Brn, VF-Fgd sand, Dry, Metagravels to 3"

METADIORITE – Dk Green, Hard, Dry, Sl. weathered fractures

Hole Terminated at 110'

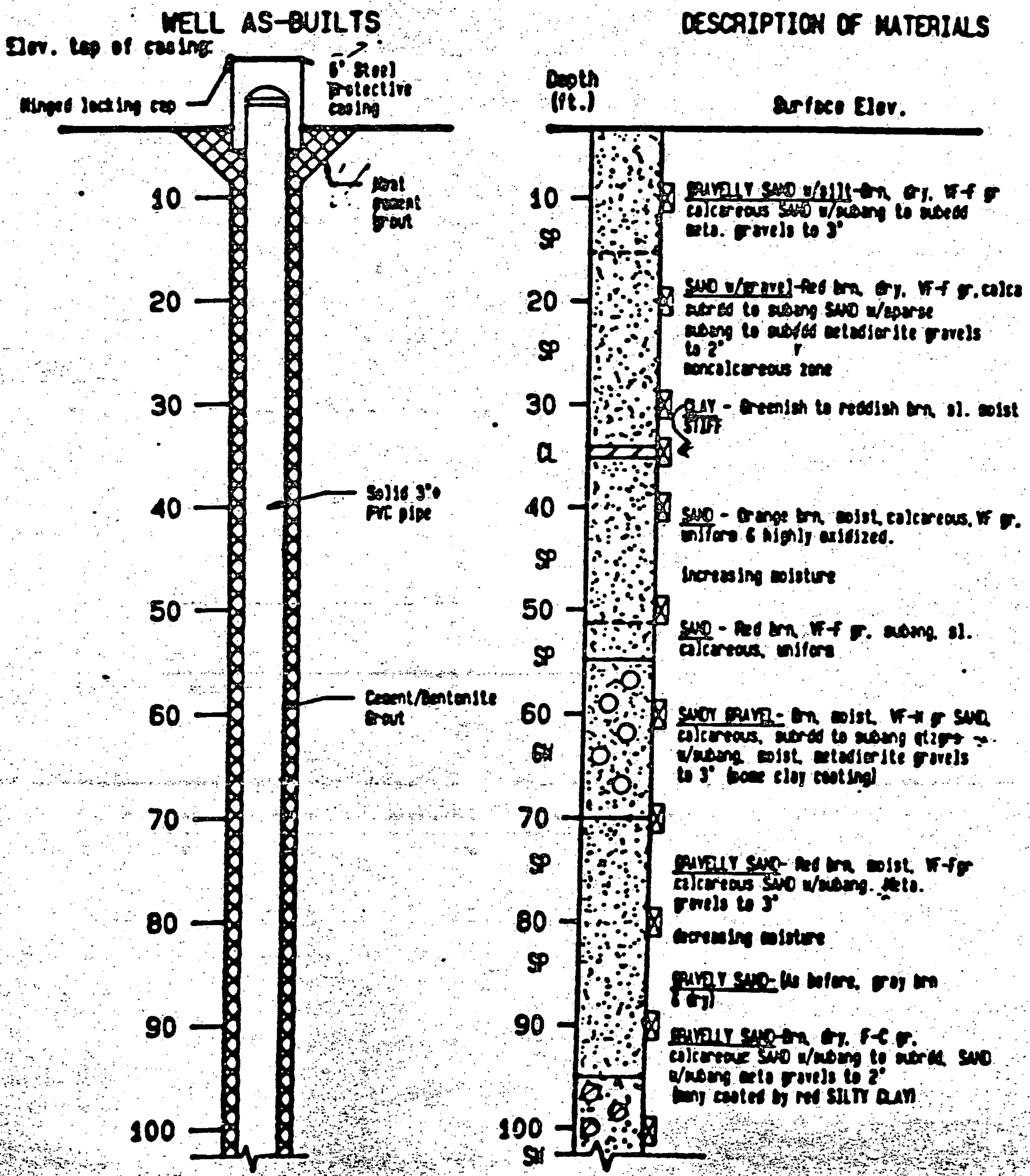
NOTES:

1. Hole advanced by Layne-West 10" air percussion hammer rig
2. Borehole logged by L.A. Flores

BOREHOLE LOGS AND WELL CONSTRUCTION RECORD
TOPOCK COMPRESSOR STATION

BORE HOLE MWP-8

DATE STARTED 10/ 1/85

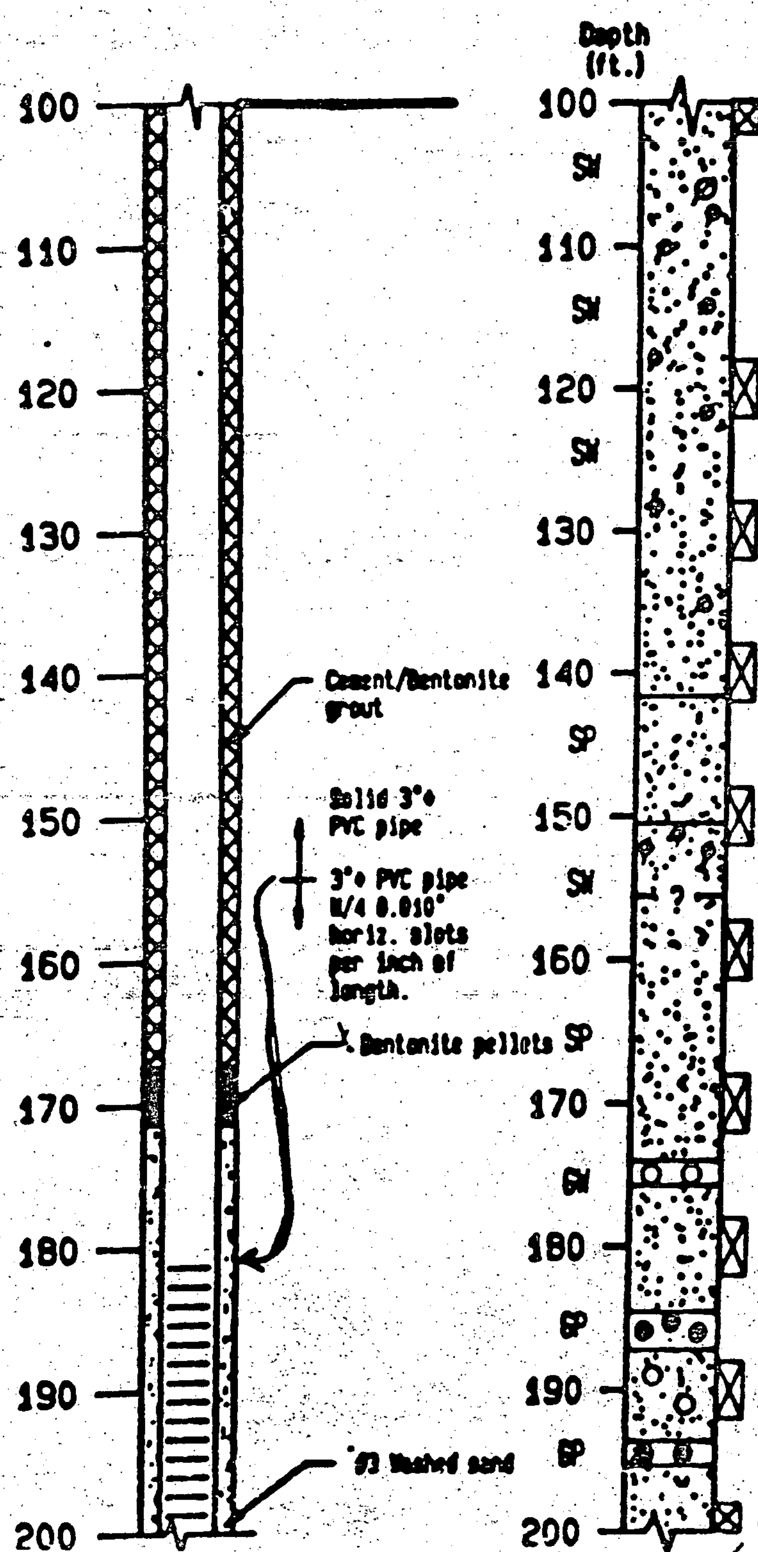


BOREHOLE LOGS AND WELL CONSTRUCTION RECORD
TOPOCK COMPRESSOR STATION

BORE HOLE MWP-8 CONT'D

DATE STARTED 10/ 1/85

WELL AS-BUILT — DESCRIPTION OF MATERIALS



GRAVELLY SAND - Moderately sorted.

GRAVELLY SAND - (As before, dry.

GRAVELLY SAND - Gray brn, sl. moist, VF - Calcareous SAND & silt w/subang to Subrdd META gravels to 2".

SAND w/gravel - Brn, VF- M gr, sl. moist Subrdd SAND & minor silt w/subrdd coarse, clay coated or decomposed gravels & blebs of clay.

SAND w/gravel - (As above, but calcareous Moderately graded).

SAND w/gravel - (As before)

GRAVEL - COBBLE Layer - Brn, sl. moist, su to subrdd, METADIORITE to 5".

SAND W/GRAVEL - Brn, sl. moist, VF-M gr w/ moist, META gravels to 2" (coated by a red brn, moist SILTY CLAY).

SANDY GRAVEL - Gray brn, sl. moist, VF- Cgr

GRAVELLY SAND w/silt - BRN, sl. moist to m VF-Cgr SAND w/META gravels to 2".

GRAVEL - COBBLE Layer.

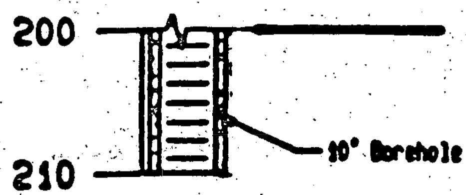
GRAVELLY SAND - Brn, sl. moist, VF-Mgr. CALCAREOUS w/clay /silt coated gravels or decomposed gravels

BOREHOLE LOGS AND WELL CONSTRUCTION RECOR
TOPOCK COMPRESSOR STATION

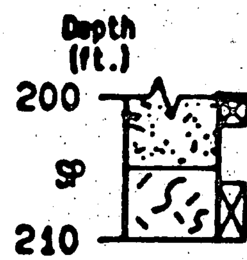
BORE HOLE MWP-8 CONT'D

DATE STARTED 10/1/85

WELL AS-BUILTS



DESCRIPTION OF MATERIALS



METADIORITE - Dk green, hard, dry, some discoloration & clay or fractured surfa
d

Hole terminated at 211.0'

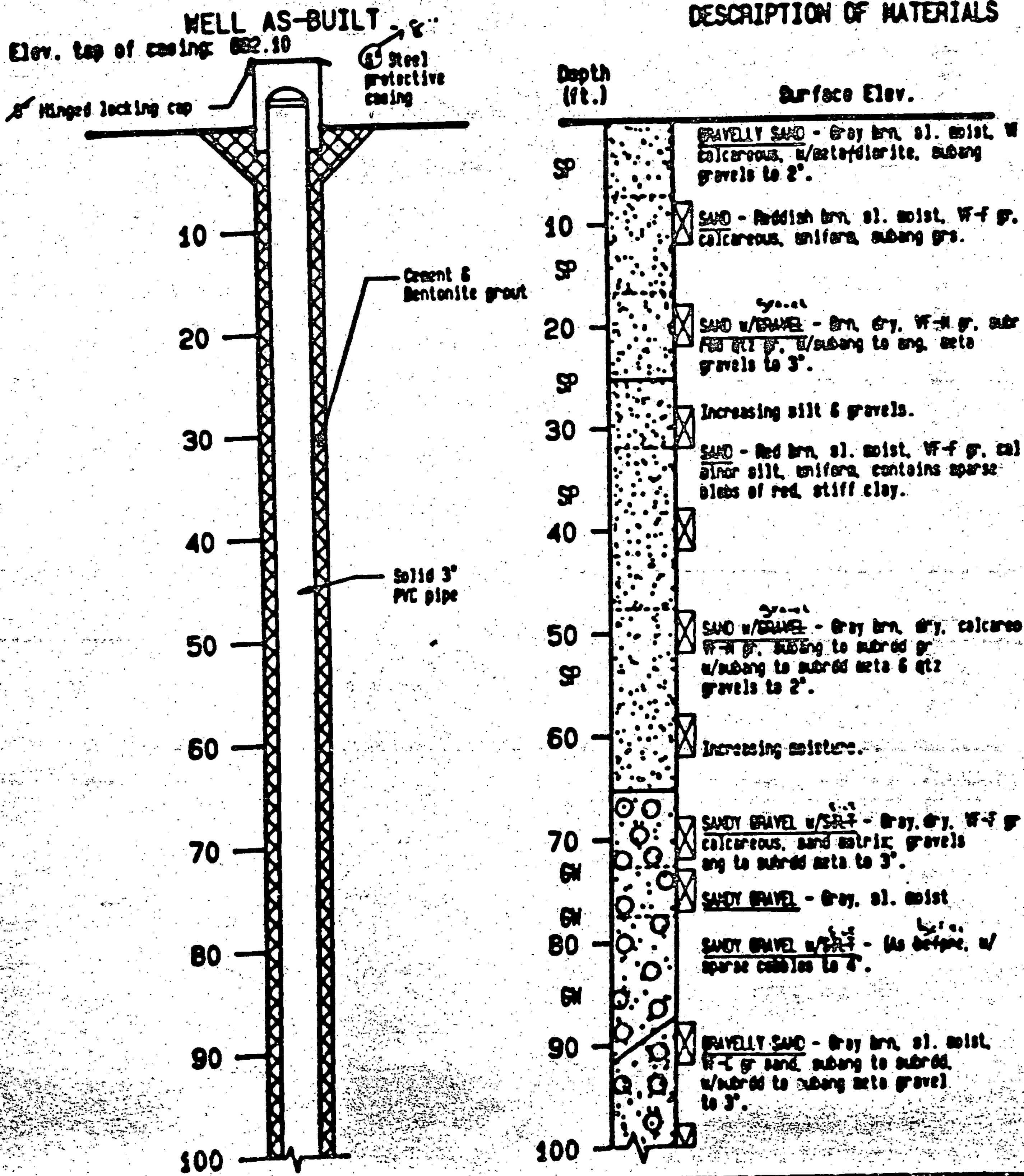
Notes:
1. Hole advanced by Layne-Westerns 10" air percussion hammer rig.
2. Borehole logged by L.A. Flora.

BOREHOLE LOGS AND WELL CONSTRUCTION RECOR

TOPOCK COMPRESSOR STATION

BORE HOLE MWP-9

DATE STARTED 10/2/85



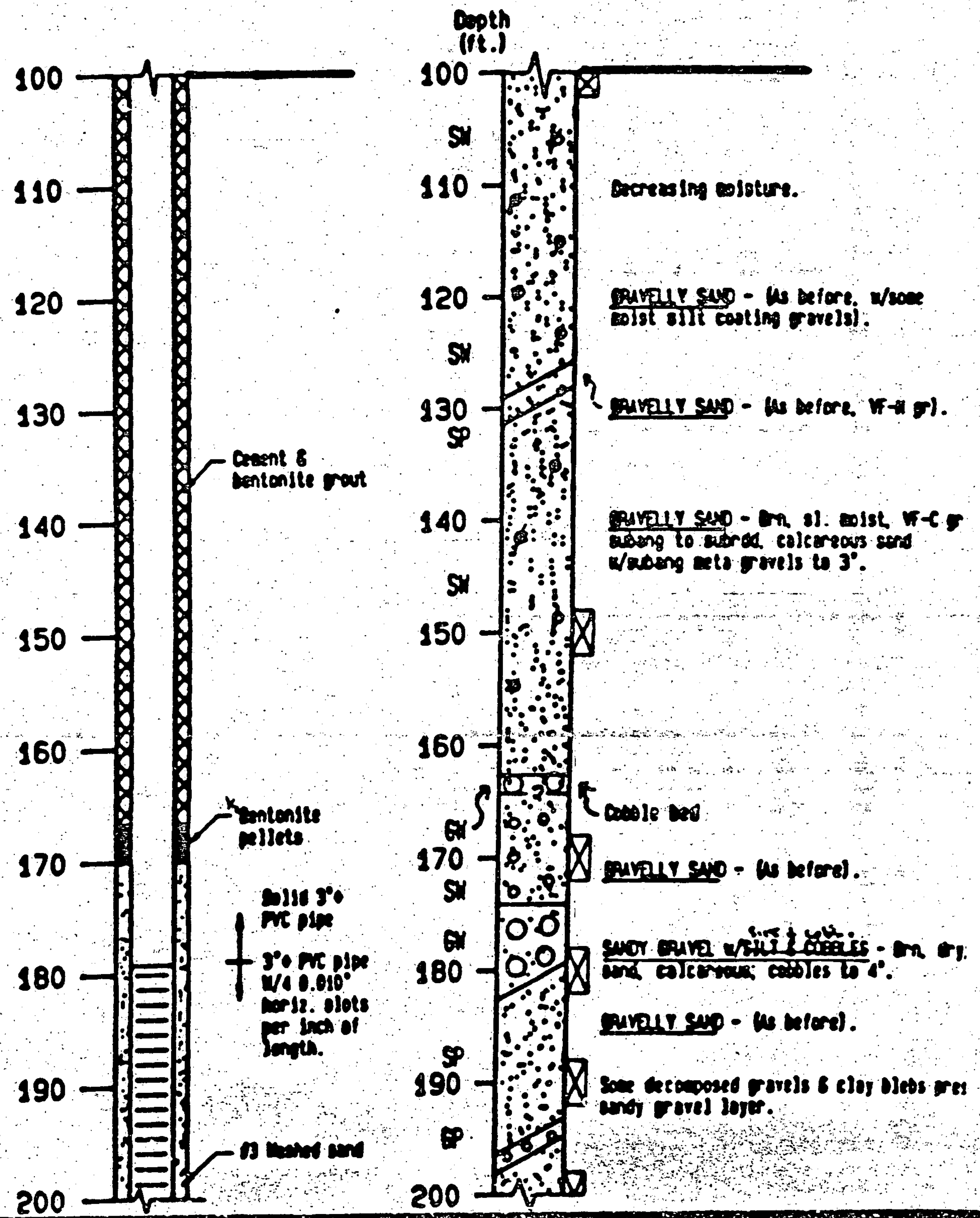
BOREHOLE LOGS AND WELL CONSTRUCTION RECORI
TOPOCK COMPRESSOR STATION

BORE HOLE MWP-9 CONT'D

DATE STARTED 10/2/85

WELL AS-BUILT

DESCRIPTION OF MATERIALS

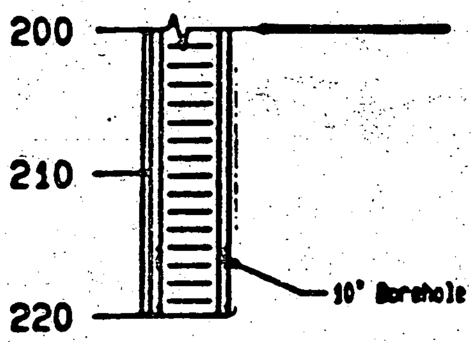


BOREHOLE LOGS AND WELL CONSTRUCTION RECORD
TOPOCK COMPRESSOR STATION

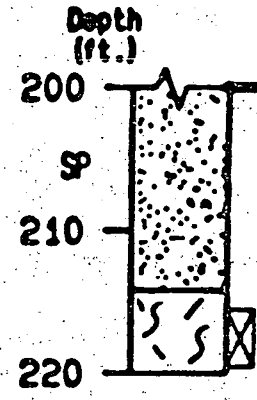
BORE HOLE MWP-9 CONT'D

DATE STARTED 10/2/85

WELL AS-BUILTS



DESCRIPTION OF MATERIALS



GRAVELLY SAND w/~~[illegible]~~ cobbles - Brn, sl. moist to moist, VF-C gr, subang to subrdd, calcareous sand w/clayey coated or decomposed gravels to 3".

GRAVELLY SAND w/~~[illegible]~~ cobbles - (As above, but wet).

METADIORITE - Dk green, hard, sl. weat sl. moist to dry.

Hole terminated at 220.0'

Notes:
1. Hole advanced by Layne-Westerns 10" air percussion hammer rig.
2. Borehole logged by L.A. Flora.

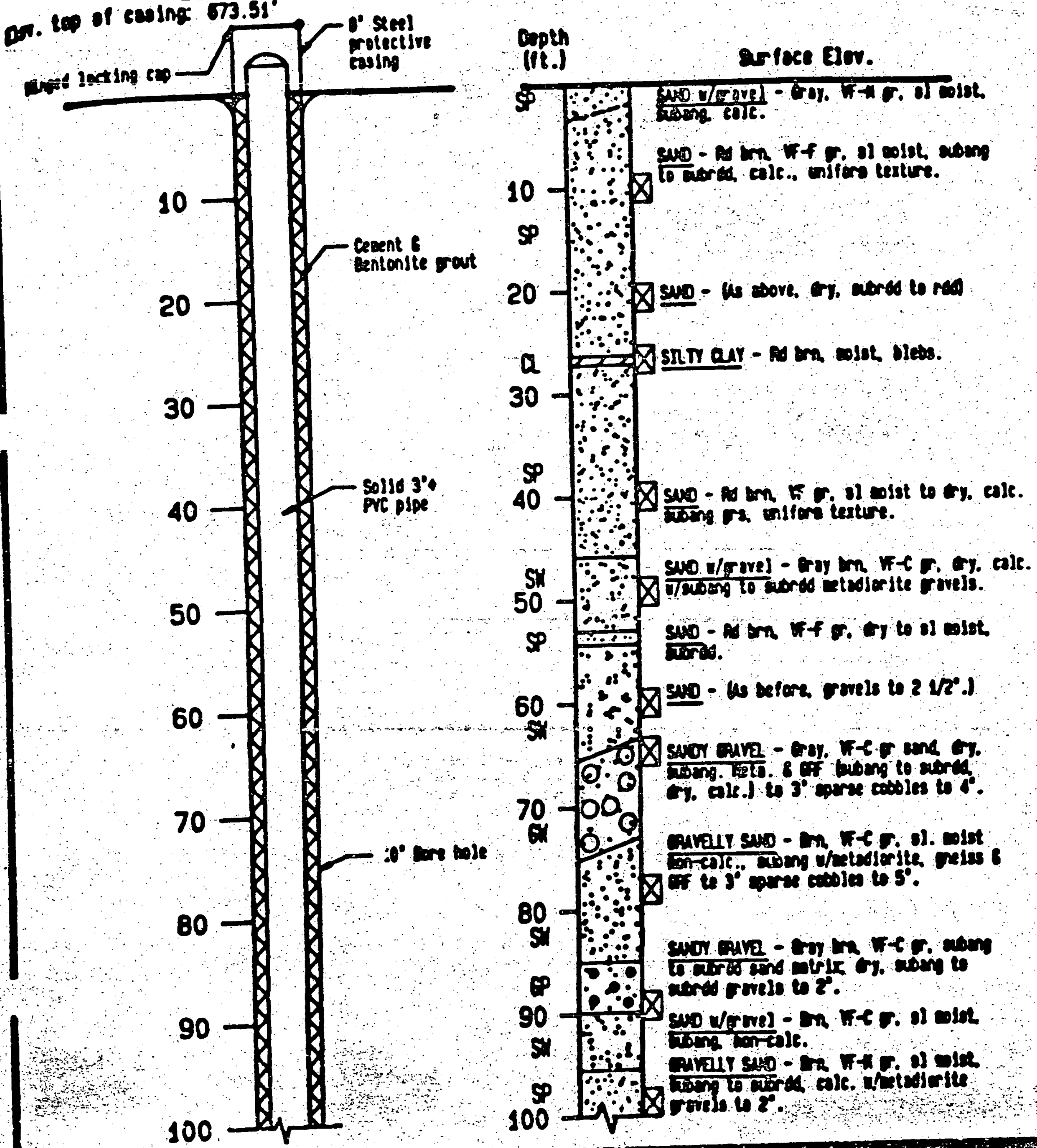
BORE HOLE LOGS AND WELL CONSTRUCTION RECORD
TOPOCK COMPRESSOR STATION

BORE HOLE MWP-10

DATE STARTED 1/28/86

WELL AS-BUILT

DESCRIPTION OF MATERIALS



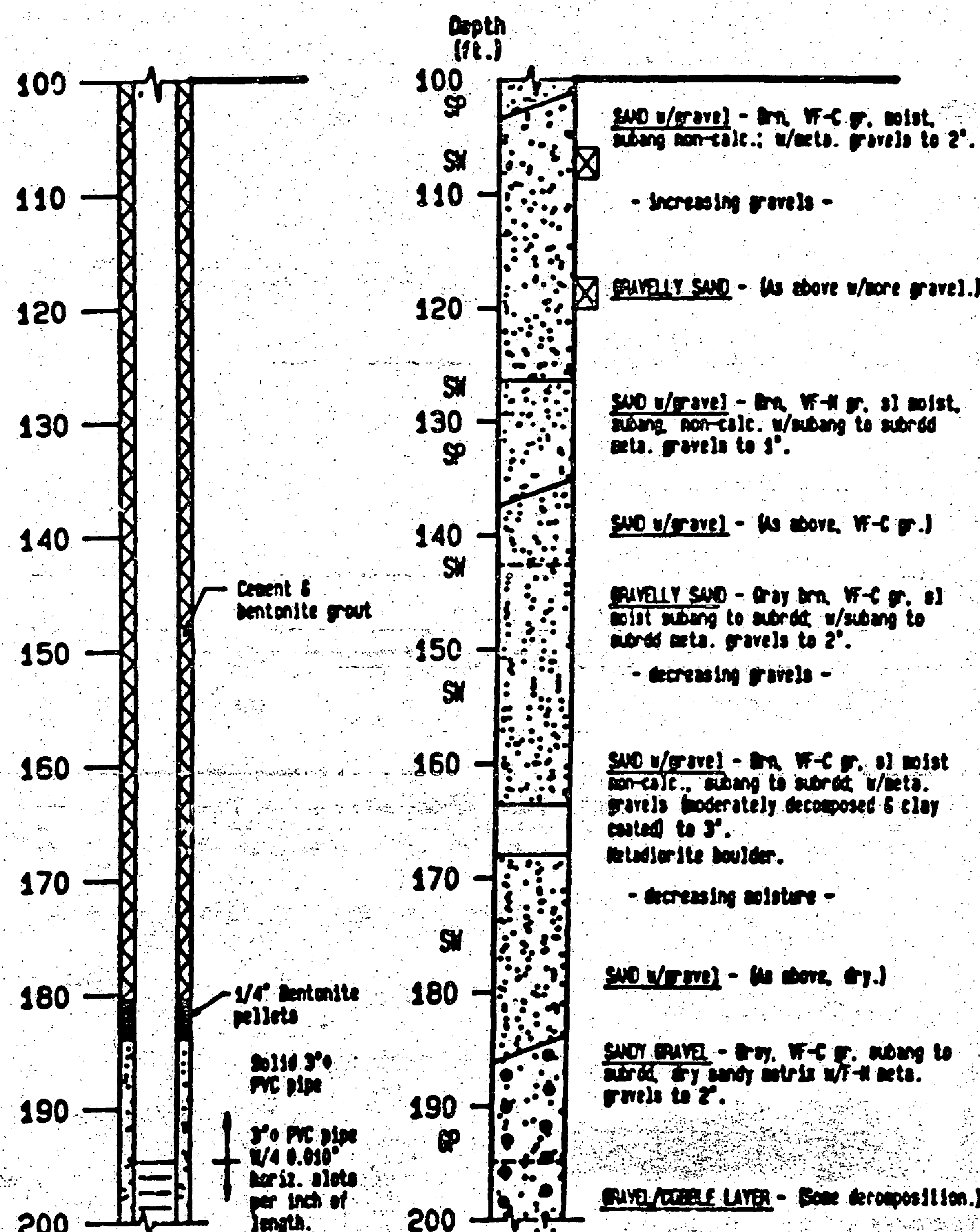
BORE HOLE LOGS AND WELL CONSTRUCTION RECORD
TOPOCK COMPRESSOR STATION

BORE HOLE MWP-10 CONT'D

DATE STARTED 1/28/86

WELL AS-BUILT

DESCRIPTION OF MATERIALS

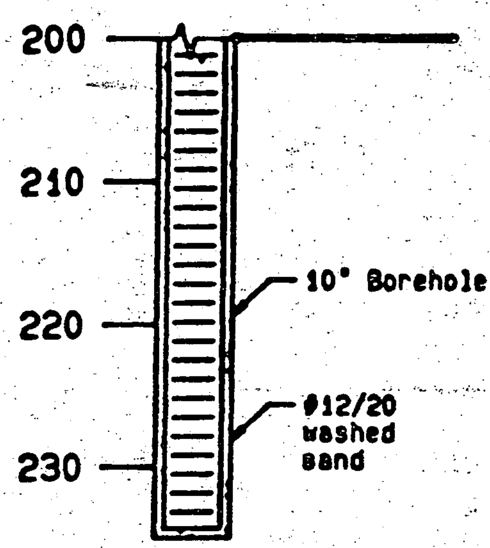


BORE HOLE LOGS AND WELL CONSTRUCTION RECORD
TOPOCK COMPRESSOR STATION

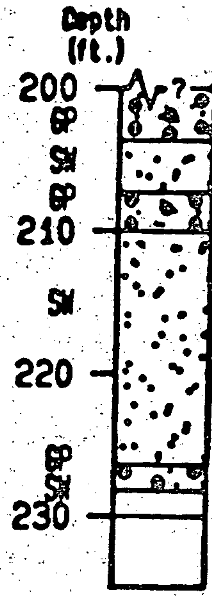
BORE HOLE MWP-10 CONT'D

DATE STARTED 1/28/86

WELL AS-BUILTS



DESCRIPTION OF MATERIALS



SANDY GRAVEL- (As before)

SAND w/gravel- Brn, VF-C gr, sl. moist, subang w/gravels to 2".

SANDY GRAVEL- (As above w/increase in gravels)

GRAVELLY SAND- Brn, VF-C gr, dry, calc., subang to subrdd w/sl. decomposed meta gravels to 2".
-Increasing moisture-

GRAVEL/COBBLE LAYER- Moist to wet.

GRAVELLY SAND- Red brn, VF-C gr, moist to wet.

METADIORITE- Dk green, hard, dry, sl. weathered.

Hole terminated at 235.0'

Notes:
1. Hole advanced by Layne-Westerns 10" air percussion hammer rig.
2. Borehole logged by L.A. Flora.

APPENDIX K

Field Log Reports
and
Water Level Record

April 5, 1989

Mr. Mohammed Khan-

As you requested, here are copies of the field data sheets compiled by Mr. Steve Gregory, Brown and Caldwell's technician who performed the field sampling activities at PG&E's Topock Gas Compressor Station during the Compliance Monitoring Evaluation conducted in early March 1989.

If you have any questions, please call me at your convenience.

REGION 7

Ground Water Sampling Log

Well Id.: P-1
Date: 3/9/89

Pump Type: [illegible]
Dedicated / Portable (circle one)
Chain of Custody Doc #: —

Depth of Casing: 210'
Casing Diameter: 30"

Depth to Water: 156.88'
Volumne Factor: .37 g/ft

Vol. Water in Casing: 53.12'
Gallons / Casing volume: 19.6 g/Vol

Time Pump on: 0840
Initial Pump Rate
(Q = gpm): Q = .31 gpm @ 3 min.

Time Pump off:

Measured by bucket, grad. cylinder, or other (Specify):

Time to Remove 3 Well Vols:

Time	Q	Gal. Removed	pH	T °C	S C	OG	Comments
0950	.31	21.7 gals	7.43	29.2	970	—	Clear
1052	.30	40.6 gals	7.47	28.4	955	—	Clear / DTW = 171.8'
1156	.29	59.5 gals	7.47	28.2	960	—	Clear / DTW = 172.5'
1238	.27	71.3 gals	7.48	28.4	955	—	Clear

3/9/89 – Collected Cr^{+6} sample after 15 min of purging

	Rep. 1	Rep. 2	Rep. 3
Final pH			
Final T°C			
Final S C			

pH meter Ser#: C14675 Calib: Yes / No
SC meter Ser#: E803048 Calib: Yes / No
WLI Ser#: 05220

Sample ID: P-1
Time Collected: 1245

Analysis Requested: See COC
Size / Preservative:

Comments:

Ground Water Sampling Log

Well Id.: MWP-3

Date: 3/7/89

Pump Type: Well Wizard

Dedicated / Portable (circle one)

Chain of Custody Doc #: ——

Depth of Casing: 215.90'

Casing Diameter: 3.0"

Depth to Water: 108.57'

Volumne Factor: .37 gal/ft

Vol. Water in Casing: 107.33'

Gallons / Casing volume: 39.7 gal/Vol

Time Pump on: 0857

Initial Pump Rate (Q = gpm): Q = .48 gpm - 283 ml

Time Pump off:

Time to Remove 3 Well Vols:

Measured by bucket, grad. cylinder, or other (Specify):

Time	Q	Gal. Removed	pH	T °C	S C	OG	Comments
1046	.40	48.0 gals	7.51	27.5°	920	—	Clear / DTW=115.
1235	.38	90.5 gals	7.50	29.1	905	—	Clear / DTW=116.
1402	.37	123.1 gals ~~132.6 gals~~	7.48	28.5	815	—	Clear / DTW=117.5
1453	.37	142.0 gals	7.48	28.4	860	—	Clear / DTW=117.8

	Rep. 1	Rep. 2	Rep. 3
Final pH			
Final T°C			
Final S C			

pH meter Serial: 014675 Calib Yes / No

SC meter Serial: 5803048 Calib Yes / No

WLI Serial: 05220

Sample ID: MWP-3

Time Collected: 1458

Analysis Requested: See COC

Size / Preservative:

Comments:

Ground Water Sampling Log

Well Id.: MWP-8   Date: 3/8/89

Pump Type: [illegible]
Dedicated / Portable (circle one)   Chain of Custody Doc #: —

Depth of Casing: 210.0'   Casing Diameter: 3.0"

Depth to Water: 177.15'   Volumne Factor: .37 gal/ft

Vol. Water in Casing: 32.85'   Gallons / Casing volume: 12.2 g/Vol

Time Pump on: 1315   Initial Pump Rate (Q = gpm): Q = .23 gpm → 53 min/[illegible]

Time Pump off:

Measured by bucket, grad. cylinder or other (Specify):

Time to Remove 3 Well Vols:

Time	Q	Gal. Removed	pH	T °C	S C	OG	Comments
1408	.26	13.0 gals	7.04	28.8	20,000	—	Clear
1452	.26	24.4 gals	8.51	28.8	19,500	Very Sl. Turbid	/ DTW = 180.7'
1538	.26	36.4 gals.	7.53	28.7	19,000		Clear / —
1605	.27	43.6 gals	7.18	28.4	19,000		Clear
1620	.27	47.6 gals	7.09	28.1	19,000		Clear
1637	.26	52.1 gals.	7.03	28.1	19,000		Clear / 182.4'
1647	"	54.7 gal	7.05	28.1	19,000		Clear

— Collected dup samples → (MWP-13)

3/9/89 ⇒ Collected Cr+6 sample (purged 15 min)

	Rep. 1	Rep. 2	Rep. 3
Final pH			
Final T°C			
Final S C			

pH meter Ser#: 014675 Calib: Yes / No
SC meter Ser#: 803098 Calib: Yes / No
WLI Ser#:

Sample ID: MWP-8   Time Collected: 1649

Analysis Requested: See COC   Size / Preservative:

Comments:

Ground Water Sampling Log

Well Id.: N. WP-9

Date: 3/7/89

Pump Type: Well Wizard
Dedicated / Portable (circle one)

Chain of Custody Doc #: - - -

Depth of Casing: 217.0

Casing Diameter: 3.0"

Depth to Water: 190.42

Volumne Factor: .37 gal/ft

Vol. Water in Casing: 26.58'

Gallons / Casing volume: 9.8 gal/Vol

Time Pump on: 1416

Initial Pump Rate (Q = gpm): Q = .16 gpm

Time Pump off:

Measured by bucket, grad. cylinder, or other (Specify):

Time to Remove 3 Well Vols:

Time	Q	Gal. Removed	pH	T °C	S C	OG	Comments
1540	.16	13.4 gals	7.51	28.1	1700	–	Clear / DTW = 192.0
1548	..	14.7 gals	Pump off - pulled pump to check air space				
1558 - Pump reinstalled - no water in air space							Q = .16 gpm.
1629	.16	19.7 gals	7.53	28.0	1600	–	Sl. Cloudy / 191.95
1729	.16	29.3 gals	756	27.9	1550	–	Sl. Cloudy / 192.10

3/8/89 Collected Cr+6 sample after 20 min of purging

	Rep. 1	Rep. 2	Rep. 3
Final pH			
Final T°C			
Final S C			

pH meter Serial: 014675 Calib Yes / No
SC meter Serial: 8803048 Calib Yes / No
WLI Serial: 05220

Sample ID: MWP-9

Time Collected: 1736

Analysis Requested: See COC

Size / Preservative:

Comments: Only getting 240 mls. max / cycle.

Ground Water Sampling Log

Well Id.: MWP-10

Date: 3/9/99

Pump Type: Well Wizard

Dedicated / Portable (circle one)

Chain of Custody Doc #: —

Depth of Casing: 234.50'

Casing Diameter: 3.0"

Depth to Water: 207.03'

Volumne Factor: .37 gal/ft

Vol. Water in Casing: 27.47'

Gallons / Casing volume: 10.2 gl/vol

Time Pump on: 0904

Initial Pump Rate (Q = gpm): Q = .19 gpm. @ 54 min

Time Pump off:

Measured by bucket/grad. cylinder or other (Specify):

Time to Remove 3 Well Vols:

Time	Q	Gal. Removed	pH	T °C	S C	OG	Comments
1000	.18	10.4 gals.	7.50	28.3	1040	—	Clear
1106	.18	22.3 gals.	7.54	28.2	1010	—	Clear / DTW=211.1'
1147	.20	30.1 gals.	7.54	28.5	1010	—	Clear
1207	.19	34.0 gals.	7.53	28.5	1015	—	Clear / DTW=211.5'

3/9/99 Collected Cr+6 sample after 20 min. of purging

	Rep. 1	Rep. 2	Rep. 3
Final pH			
Final T°C			
Final S C			

pH meter Serial: 014675 Calib Yes / No

SC meter Serial: 8603048 Calib Yes / No

WLI Serial: C5220

Sample ID: MWP-10

Time Collected: 1213

Analysis Requested: See COC

Size / Preservative:

Comments:

Ground Water Sampling Log

Well Id.: MWP-12

Date: 3/7/89

Pump Type: Well Wizard

Dedicated / Portable (circle one)

Chain of Custody Doc #: —

Screen = 96-136

Depth of Casing: 132.0'

Casing Diameter: 3.0"

Depth to Water: 105.03'

Volumne Factor: .37g/ft

Vol. Water in Casing: 26.97'

Gallons / Casing volume: 10.0 g/Vol

Time Pump on: 0943

Initial Pump Rate (Q = gpm): Q = .34 gpm.

Time Pump off:

Measured by bucket, grad. cylinder, or other (Specify):

Time to Remove 3 Well Vols:

Time	Q	Gal. Removed	pH	T °C	S C	OG	Comments
1028	.34 gpm.	15.3 gals.	7.45	27.5	1300	—	Clear / DTW=115..
1213	.11	38.4 gals.	7.47	29.1	~~1000~~ 1040		Sl. Cloudy / DTW=121.9
1223	.12	39.6 gal.	7.46	28.7	1040		Sl. Cloudy
1225		Pump off for recovery.					
1321		DTW = 119.55'	Pump on at 1322				Q = .31 gpm
1329	.29	41.7 gals	7.45	30.1	1050		Sl Cloudy
1334		DTW = 121.90'					

3/9/89 – Collected Cr^{+6} sample after 20 min. of purging

	Rep. 1	Rep. 2	Rep. 3
Final pH			
Final T°C			
Final S C			

pH meter Serial: 014675 Calib Yes / No

SC meter Serial: 8803048 Calib Yes / No

WLI Serial: 05220

Sample ID: MWP-12

Time Collected: 1335

Analysis Requested: See COC

Size / Preservative:

Comments:

Ground Water Sampling Log

Well Id.: mwP-1 | Date: 3/7/99

Pump Type: ______
Dedicated / Portable (circle one)

Chain of Custody Doc #: ______

Depth of Casing: ______

Casing Diameter: ______

Depth to Water: DRY

Volumne Factor: ______

Vol. Water in Casing: ______

Gallons / Casing volume: ______

Time Pump on: ______

Initial Pump Rate
(Q = gpm): ______

Time Pump off: ______

Measured by bucket, grad. cylinder, or other (Specify): ______

Time to Remove 3 Well Vols: ______

Time	Q	Gal. Removed	pH	T °C	S C	OG	Comments
		Not Sampled					

	Rep. 1	Rep. 2	Rep. 3
Final pH			
Final T°C			
Final S C			

pH meter Ser#: ______ Calib: Yes / No
SC meter Ser#: ______ Calib: Yes / No
WLI Ser#: ______

Sample ID: ______ Time Collected: ______

Analysis Requested: ______ Size / Preservative: ______

Comments:

Ground Water Sampling Log

Well Id.: MWP-2

Date: 3/7/89

Pump Type:

Dedicated / Portable (circle one)

Chain of Custody Doc #:

Depth of Casing: 185.4' (Sounded)

Casing Diameter:

Depth to Water: 177.87

Volumne Factor:

Vol. Water in Casing:

Gallons / Casing volume:

Time Pump on:

Initial Pump Rate (Q = gpm):

Time Pump off:

Time to Remove 3 Well Vols:

Measured by bucket, grad. cylinder, or other (Specify):

Time	Q	Gal. Removed	pH	T °C	S C	OG	Comments
	Not Sampled						

	Rep. 1	Rep. 2	Rep. 3
Final pH			
Final T°C			
Final S C			

pH meter Ser#: Calib: Yes / No

SC meter Ser#: Calib: Yes / No

WLI Ser#:

Sample ID:

Time Collected:

Analysis Requested:

Size / Preservative:

Comments:

Ground Water Sampling Log

Well Id.: MWP-7

Date: 3/7/89

Pump Type: ______

Dedicated / Portable (circle one)

Chain of Custody Doc #: ______

Depth of Casing: ______

Casing Diameter: ______

Depth to Water: Dry

Volumne Factor: ______

Vol. Water in Casing: ______

Gallons / Casing volume: ______

Time Pump on: ______

Initial Pump Rate (Q = gpm): ______

Time Pump off: ______

Measured by bucket, grad. cylinder, or other (Specify): ______

Time to Remove 3 Well Vols: ______

Time	Q	Gal. Removed	pH	T °C	S C	OG	Comments
	Not Sampled						

	Rep. 1	Rep. 2	Rep. 3
Final pH			
Final T°C			
Final S C			

pH meter Ser#: ______ Calib: Yes / No

SC meter Ser#: ______ Calib: Yes / No

WLI Ser#: ______

Sample ID: ______

Time Collected: ______

Analysis Requested: ______

Size / Preservative: ______

Comments:

Address

3410-03

Phone #

City State Zip

Report attention: Pat Wiegand.

Sampled by: S. Gregory.

Page 1

Lab Sample number	Date sampled	Time sampled	Type: See key below	Sample description	Number of containers	Cr+6	metals: Cr, Fe, Mn, Na, Ca	TOC	TOX	pH TDS, Cl	SO4	PO4	Hazardous sample Special handling required	Remarks
	3/8/89		GW	P-1	5		X	X	X	X	X	X		
	3/9/89		GW	P-1	1	X								
	3/7/89		GW	MWP-3	5		X	X	X	X	X	X		
	[illegible]		GW	MWP-3	1	X								
	[illegible]		GW	MWP-8	5		X	X	X	X	X	X		
	3/7/89		GW	MWP-8	1	X								
	3/7/89		GW	MWP-9	5		X	X	X	X	X	X		
	[illegible]		GW	MWP-9	1	X								
	[illegible]		GW	MWP-10	5		X	X	X	X	X	X		
	3/7/89		GW	MWP-10	1	X								
	3/7/89		GW	MWP-12	5		X	X	X	X	X	X		
	3/9/89		GW	MWP-12	1	X								

	Signature	Print Name	Company	Date	Time
Relinquished by	Steve Gregory	Steve Gregory	B+C	3/10/89	09
Received by					
Relinquished by					
Received by					
Relinquished by					
Received by Laboratory	Ulysses Bellon	Ulysses Bellon	B&C	3/10/89	09

BROWN AND CALDWELL LABORATORIES

[ ] 1255 Powell Street, Emeryville, CA 94608 (415) 428-2300

[ ] 373 South Fair Oaks Avenue, Pasadena, CA 91105 (818) 795-7553

[ ] 1200 Pacifico Avenue, Anaheim, CA 92805

Note:
Samples are discarded 30 days after results are reported unless other arrangements are made.
Hazardous samples will be returned to client or disposed of at client expense.

*KEY: AQ—Aqueous NA—Nonaqueous SL—Sludge GW—Groundwater SO—Soil OT—Other PE—

[illegible]

Address

Project or PO#: 3410-03

Phone #

City, State Zip

Report attention: Pat Wiegand

Sampled by: S. Gregory

page 2.

Analyses required

Lab Sample number	Date sampled	Time sampled	Type* See key below	Sample description	Number of containers	Cr+6	metals: Cr, Fe, Mn+Na+Ca	TOC	TOX	pH, TDS, Cl	SO4	PO4	Hazardous sample / Special handling required	Remarks
	3/8/89		GW	MWP-13	5		X	X	X	X	X	X		
	3/9/89		GW	MWP-13	1	X								
	[illegible]		GW	Trip Blank	4	X		X	X					

	Signature	Print Name	Company	Date	Time
Relinquished by	Steve Gregory	Steve Gregory	B&C	3/10/89	091[illegible]
Received by					
Relinquished by					
Received by					
Relinquished by					
Received by Laboratory	Ulysses Bellon	Ulysses Bellon	B&C	3/10/89	092[illegible]

BROWN AND CALDWELL LABORATORIES

☐ 1255 Powell Street, Emeryville, CA 94608 (415) 428-2300

☐ 373 South Fair Oaks Avenue, Pasadena, CA 91105 (818) 795-7553

☐ 1200 Pacifica Avenue, Anaheim, CA 92805

Note:
Samples are discarded 30 days after results are reported unless other arrangements are made.
Hazardous samples will be returned to client or disposed of at client expense.

*KEY: AQ—Aqueous NA—Nonaqueous SL—Sludge GW—Groundwater SO—Soil OT—Other PE—Petro[illegible]

APPENDIX L

Chain of Custody Record
and
DHS-LA Analysis Results
on
Split Samples

STATE OF CALIFORNIA

OFFICE MEMO

STD 100 (REV 11-79)

TO | DATE

George Baker.

ROOM NUMBER

FROM

Janice Wakakuwa.

PHONE NUMBER

SUBJECT:

This is The final Report
from our Laboratory.
The samples for TOX have been
sent to the Berkeley Laboratory
for analysis. I cannot do TOC
since I do not have The instrument
necessary for this analysis.
Tom Li in Berkeley said
They could not do this analysis
and There was no contract
laboratory on line for this
analysis.

Janice.

RECEIVED
APR 07 1989
TOXIC SUBSTANCES CONTROL DIVISION
REGION 4
LONG BEACH

State of California-Health and Welfare Agency

Department of Health Servs

HAZARDOUS MATERIALS SAMPLE ANALYSIS REQUEST

All applicable items must be completed

1 HML No 　To

2 Page 1 of 1

Collector/Address: G Baker 245 W. Bdy, St 350 Long Beach, CA 90802

4 Phone (213) 590-5918

5 Priority ☐ a Authorized by

6 Date Sampled 3/7/89 and 3/8/89　7 Time Sampled　Hours

9 Activity ☐ Enf ☐ Surv ☐ Site Mit ☐ Permitting ☐ Alt Tech ☑ Other

8 Codes (fill in all applicable codes)

- a STC: 3 0 3 3
- b Region: 6
- c TPC:
- d INDEX: 7 1 2 0
- e. PCA:
- f. SITE:
- g County:

10. SAMPLING LOCATION

a EPA ID No: CAT080011729

b Site: Pacific Gas & Electric Topock

c Address: Topock Station Topock, CA (Number / Street / City / Zip)

11. SAMPLES

a. ID	b. Collector's No	c. HML No.	d. Type	Container e. Type	f. Size	g. Field Information
A.	MWP12	6919	H_2O			
B.	MWP3	6920	"			Well water
C.	MWP9	6921	"			"
D.	MWP8	6922	"			"
E.	MWP10	6923	"			"
F.	P-1	6924	"			"
G.						
I.						

FIELD

12. ANALYSIS REQUESTED

- a. ☑ pH: All
- b. ☐ Metal Scan
- c. ☑ Metals (Spec): Cr(T), Fe, Mn, Na, Ca
- d. ☐ W.E.T.
- f. ☐ PCB
- g. ☑ VOA
- h. ☐ PAH
- i. ☐ Phenols
- j. ☐ Carbamates
- k. ☐ Ext. Org (Screeng)
- l. ☐ Chlorinated Pesticides
- m. ☐ Organo-P Pesticides
- n. ☑ TOC: All
- o. ☑ TOX: All

☑ TDS.- All　☑ Cl, SO_4, PO_4 (SE) as P

☑ E

13. CHAIN OF CUSTODY

	Signature	Name/Title	Inclusive Dates
a	G. R. Baker	G.R. Baker / AHMS	3/7/89 - 3/8/89
b	Monina A. Ligas	Monina Ligas / PH. Chem II	3/8/89 - 3/9/89
c			/ / - / /
d			/ / - / /

14. SPECIAL REMARKS

15 RECEIVED BY Monina A. Ligas　a Title PH Chem II　b Date 3/9/89

SAMPLE ALLOCATION　a. ☐ HML-Berkeley　b. ☐ HML-SC　c. ☐ AIHL　d ☐ Contract　b. Date

17 ANALYSIS REQUESTED

LAB

LABORATORY REPORT
Hazardous Materials Unit
Southern California Laboratory Section
Telephone 620-3376

To : George Baker
SCL No. : 6919 to 6824
Sampling No : see below
Date : 3/10/89
Sample Location : Pacific Gas & Electric
Topock Station

Analytical Procedures Used : Hexachrome Standard Methods of analysis
pH 9040

Analysis Results

SCL No.	Field No.	Hexavalent Chromium mg/1	pH
6919	MWP12	<0.003	7.2
6920	MWP3	<0.003	7.2
6921	MWP9	<0.003	7.3
6922	MWP8	0.005	7.0
5923	MWP10	<0.003	7.7
6924	P-1	<0.003	7.5

Analyst's Signatures:
Monina Ligas 3/13/89
Monina Ligao Date
Date

Supervising Chemist's Signature:
Janice Wakakuwa 3/13/89
Janice Wakakuwa Date

RECEIVED
MAR 14 1989
TOXIC SUBSTANCES CONTROL DIVISION
REGION 4
LONG BEACH

State of California-Health and Welfare Agency

Department of Health Services

HAZARDOUS MATERIALS SAMPLE ANALYSIS REQUEST

All applicable items must be completed

1 HML No. To

2 Page 1 of 1

Collector/Address: G Baker 245 W. Bdy, st 350 Long Beach, CA 90802

4 Phone (213) 590-5918

5 Priority ☐

a Authorized by

6 Date Sampled 3/7/89 and 3/8/89

7 Time Sampled . Hours

8 Codes (fill in all applicable codes)

a STC	3 C 33
b Region	6
c TPC	
d INDEX	7 1 2 C
e PCA	
f SITE	
g County	

9 Activity ☐ Enf ☐ Surv ☐ Site Mit ☐ Permitting ☐ Alt Tech ☑ Other

10. SAMPLING LOCATION

a EPA ID No: CAT080011729

b Site: Pacific Gas & Electric Topock

c Address: Topock Station Topock, CA

Number Street City Zip

11. SAMPLES

a. ID	b. Collector's No	c. HML No.	d. Type	Container e. Type	Container f. Size	g. Field Information
A.	MWP12	6919	H2O			Well water
B.	MWP3	6920	"			"
C.	MWP9	6921	"			"
D.	MWP8	6922	"			"
E.	MWP10	6923	"			"
F.	P-1	6924	"			
G.						
H.						

10 ... REGION 7

12. ANALYSIS REQUESTED

a ☑ pH ALL

b ☐ Metal Scan

c ☑ Metals (Spec) Cr(T), Fe, Mn, Ni, Ca

d ☐ W.E.T.

f ☐ PCB

g ☑ VOA

h ☐ PAH

i ☐ Phenols

j ☐ Carbamates

k ☐ Ext. Org (Screeng)

l ☐ Chlorinated Pesticides

m ☐ Organo-P Pesticides

n ☑ TOC ALL

o ☑ TDS ALL

☑ TDS - ALL ☑ CL, SO4, PO4 (as P)

13. CHAIN OF CUSTODY

	Signature	Name/Title	Inclusive Dates
a	G. R. Baker	G.R. Baker / AHMS	3/7/89 - 3/8/89
b	[signature]	Mioni ... Ligas / PH. Chem II	3/8/89 - 3/9/89
c			/ / - / /
d			/ / - / /

14. SPECIAL REMARKS

15 RECEIVED BY [signature] a. Title PH Chem II b. Date 3/9/89

16 SAMPLE ALLOCATION a. ☐ HML-Berkeley b. ☐ HML-SC c. ☐ AIHL d ☐ Contract b. Date

RECEIVED MAR 30 1989 TOXIC SUBSTANCES CONTROL DIVISION REGION 4 LONG BEACH

17. ANALYSIS REQUESTED

QC REPORT
Southern California Laboratory
Hazardous Materials Unit
Telephone 213-620-3376

To : George Baker   Sample Set SCL Nos. :6919 to 6924

Matrix : water   Date : 3/28/89

Duplicate done on sample: 6920   Spike done on : 6920

Sample Location :Pacific Gas & Electric

Analytical Procedures Used : Standard Methods of Analysis for Water and Waste Water 16th Ed.

ANALYTE	Method Blank	Method Standard Recovery	Duplicate RPD	Matrix Spike % Rec
Units	ppm	%	%	%
Chloride	<1	100	8	100
Acceptable values		80% and 110%	Difference <20%	75%-125%

Analyst's Signatures:

Jay Patel   3-28-89
Jay Patel   Date

Supervising Chemist's Signature:

Janice Wakakuwa   3/28/89
Janice Wakakuwa   Date

LABORATORY REPORT
Hazardous Materials Unit
Southern California Laboratory Section
Telephone 620-3376

To : George Baker
SCL No. : 6919 to 6924
Sampling No : see below
Date : 3/28/89
Sample Location : Pacific Gas & Electric Topock
Topok Station Topock, Ca.

Analytical Procedures Used : Standard Methods of Analysis for Water and Waste Water 16th Ed.

Analysis Results in mg/l

SCL No.	Field No.	TDS*	Chloride	Sulfate	Phosphorous as P
6919	MWP 12	673	180	123	<1
6920	MWP 3	552	125	102	<1
6921	MWP 9	832	260	140	<1
6922	MWP 8	11,917	6920	506	<1
6923	MWP 10	663	180	132	<1
6924	P 1	643	170	138	1

Analyst's Signatures:

J Patel
Jay Patel
3.28.89
Date
Date

Supervising Chemist's Signature:

Janice Wakakuwa
Janice Wakakuwa
3/28/89
Date

RECEIVED
MAR 30 1989
TOXIC SUBSTANCES CONTROL DIVISION
REGION 4
LONG BEACH

State of California-Health and Welfare Agency

Department of Health Services

HAZARDOUS MATERIALS SAMPLE ANALYSIS REQUEST

All applicable items must be completed

1 HML No ____ To ____

2 Page 1 of 1

Collector/Address: G Baker 245 W. Bdy, Ste 350 Long Beach, CA 90802

4 Phone (213) 590-5918

5 Priority ☐

a Authorized by

6 Date Sampled 3/7/89 and 3/8/89

7 Time Sampled ____ Hours

8 Codes (fill in all applicable codes)

a STC	3 1 3 3
b Region	6
c TPC	
d INDEX	7 1 2 C
e PCA	
f SITE	
g County	

9 Activity ☐ Enf ☐ Surv ☐ Site Mit ☐ Permitting ☐ Ad Tech ☑ Other

10. SAMPLING LOCATION

a EPA ID No: CAT080011729

b. Site: Pacific Gas & Electric Topock

c. Address: Topock Station Topock, CA
Number Street City Zip

11. SAMPLES

a. ID	b. Collector's No.	c. HML No.	d. Type	Container e. Type	Container f. Size	g. Field Information
A.	MWP12	6919	H_2O			
B.	MWP3	6920	"			Well water
C.	MWP9	6921	"			"
D.	MWP8	6922	"			"
E.	MWP10	6923	"			"
F.	P-1	6924	"			"
G.						
H.						

FIELD

12. ANALYSIS REQUESTED

a. ☑ pH ALL

b. ☐ Metal Scan

c. ☑ Metals (Spec) Cr(T), Fe, Mn, Na, Ca

d. ☐ W.E.T.

☑ TDS - ALL ☑ Cl, SO4, PO4 (SP) as P)

f. ☐ PCB

g. ☑ VOA

h. ☐ PAH

i. ☐ Phenols

j. ☐ Carbamates

k. ☐ Ext. Org (Screeng)

l. ☐ Chlorinated Pesticides

m. ☐ Organo-P Pesticides

n. ☑ TOC ALL

o. ☑ TOX ALL

13. CHAIN OF CUSTODY

	Signature	Name/Title	Inclusive Dates
a	G R Baker	G.R. Baker / Atkins	3/7/89 - 3/8/89
b	Monica S. Lyes	Monica Lyes / PH. Chem II	3/8/89 - 3/9/89
c			/ / - / /
d			/ / - / /

14 SPECIAL REMARKS

15. RECEIVED BY Monica S. Lyes a. Title PH Chem II b Date 3/9/89

SAMPLE ALLOCATION a. ☐ HML-Berkeley b ☐ HML-SC c ☐ AIHL d ☐ Contract b Date

17. ANALYSIS REQUESTED

LAB

Lab·ratory Rep· t
Hazar··us Materia·s Unit
Southern C·lifornia L·boratory
Tele··one 213-620-3376

To : George Baker SCL No. : 6919 to 6924

Sampling Number: see below Date : 4/3/89

Sample Location: Pacific Gas & Electric
Topick Station, Ca.

Analytical Procedures Used : SW 846 3010 Na and Ca by ICP
Fe and Mn by flame AA
cr by Graphite AA

Analysis Results

SCL No	6919	6920	6921	6922	6923	6924
Field No.	MWP12	MWP13	MWP9	MWO8	MWP10	P 1
Units	mg/1	mg/1	mg/1	mg/1	mg/1	mg/1
Calcium	127	101	150	3800	128	127
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
ron	0.25	0.19	<0.01	<0.01	<0.01	<0.01
Manganese	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Sodium	79	66	102	414	99	68

Analyst's Signature Supervising Chemist's Signature

Monina Ligao 4/4/89 Janice Wakakuwa 4/4/89
Monina Ligao Date Janice Wakakuwa Date

California Department of Health Services
Hazardous Materials Laboratory
2151 Berkeley Way, Berkeley 94704

E 1394 to
E 1399

Laboratory Report

P. 1 of 2

Total Organic Halides

Collector: G. Baker

Date Collected: 3-7-89

Sampling Location: P.G.E.
Topock Station
Topock ,Ca.

Date Received by Lab: 3-16-89

Lab Results Status:
Partial x Final ___ Supple. ___

Analytical Procedure: Adsorption on charcoal followed by pyrolysis and coulometric titration with silver ion.

Reference: EPA Method 9020

CAS #		E 1394*	E 1395*	E 1396*	Method Blank	Detection Limit
	HML Number -->	E 1394*	E 1395*	E 1396*		
	Collector's Sample Number -->	MWP12	MWP 3	MWP 9	Method Blank	Detection Limit
	Matrix -->	water	water	water	DIW**	
CAS #	Units -->	ug/L	ug/L	ug/L	ug/L	ug/L
	total organic halide(asCl)	23.	16.	23.	ND	3.3

RECEIVED
APR 24 1989
REGION 7

**DIW =Deionized water
* Data indicate possible negative bias ;results should be considered lower limit only.

Note: ND = Not Detected NA = Not Analyzed

Sample Prep.: Arthur Holden 4-3-89

Analyst: Arthur Holden 4-3-89

Supervisor: Howard S. Okamoto Gamail Garche 4/10/89

Signature Date

HO/ft/genform

California Department of Health Services
Hazardous Materials Laboratory
2151 Berkeley Way, Berkeley 94704

Laboratory Report

Total Organic Halides

Collector: G. Baker

Date Collected: 3-7-89

Sampling Location: P.G.E.
Topock Station
Topock ,Ca.

Date Received by Lab: 3-16-89

Lab Results Status:
Partial x Final ___ Supple. ___

Analytical Procedure: Adsorption on charcoal followed by pyrolysis and coulometric titration with silver ion.

Reference: EPA Method 9020

	HML Number -->	E 1398*	E 1399*	E 1397		Detection Limit
	Collector's Sample Number -->	MWP 10	P-1	MWP 8		
	Matrix -->	water	water	water		
CAS #	Units -->	ug/L	ug/L	ug/L	ug/L	ug/L
	total organic halide(asCl)	16.	8.6	NA		3.3

* Data indicate possible negative bias ;results should be considered lower limit only.

Note: ND = Not Detected NA = Not Analyzed- E 1397 was broken in transit.

Sample Prep.: Arthur Holden 4-3-89

Analyst: Arthur Holden 4-3-89

Supervisor: Howard S. Okamoto Y Jamail Gardie 4/10/89

Signature Date

HO/ft/genform

California Department of Health Services
Hazardous Materials Laboratory
2151 Berkeley Way, Berkeley 94704

HML # E 1394 to E 1399

Laboratory Report

QUALITY CONTROL SUMMARY

Collector: G. Baker

Sampling Location: P.G.E.
Topock Station
Topock, Ca.

Analysis for: total organic halides

Matrix: water

HML NUMBER -->		E 1394				E 1399			Detection Limit
COLLECTOR'S NUMBER -->		MWP 12				P-1			
QC SAMPLE TYPE -->		DUPLICATE RESULTS				MATRIX SPIKE RESULTS			
		RUN 1	RUN 2	AVER.	RPD	ADDED	RECOVERED		
COMPOUND	UNITS -->	ug/L	ug/L	ug/L	%	ug/L	ug/L	%REC.	ug/L
total organic halide(asCl)		22.8	23.2	23.0	1.7	25.0	23.6	94.4	3.3

Comments:

Notes: ND = Not Detected
NA = Not Analyzed because of matrix interference.

RPD = Relative Percent Difference

$$= \frac{|\text{RUN 1} - \text{RUN 2}|}{(\text{RUN 1} + \text{RUN 2})/2} \times 100\%$$

RECOVERED = (Background + Spike) - Background

		Signature	Date
Sample Prep.:	Arthur Holden		4-3-89
Analyst:	Arthur Holden		4-3-89
Supervisor:	Howard S. Okamoto	Jarnail Garcha	4/10/89

HO/ft/dupqcrpt

HAZARDOUS MATERIALS SAMPLE ANALYSIS REQUEST

All applicable items must be completed

1. HML No E1394 To E1399

2. Page 1 of 1

3. Collector/Address: G. Baker 245 W. Bdy, Ste 350 Long Beach, CA 90802

4. Phone (213) 590-5918

5. Priority ☐
a. Authorized by

6. Date Sampled 3/7/89 and 3/8/89

7. Time Sampled . Hours

8. Codes (fill in all applicable codes)

a. STC	3 C 3 3
b. Region	6
c. TPC	
d. INDEX	7 1 2 C
e. PCA	
f. SITE	
g. County	

9. Activity ☐ Enf ☐ Surv ☐ Site Mit ☐ Permitting ☐ Alt Tech ☑ Other

10. SAMPLING LOCATION

a. EPA ID No. CAT080011729

b. Site Pacific Gas & Electric Topock

c. Address Topock Station Topock, CA
Number Street City Zip

HML BERKELEY#

11. SAMPLES

a. ID	b. Collector's No.	c. HML No.	d. Type	e. Container Type	f. Size	g. Field Information
A.	MWP12	6919	H_2O	E1394		Well water
B.	MWP3	6920	"	E1395		"
C.	MWP9	6921	"	E1396		"
D.	MWP8	6922	"	E1397		" BROKEN IN TRANSIT
E.	MWP10	6923	"	E1398		"
F.	P-1	6924	"	E1399		
G.						
H.						

12. ANALYSIS REQUESTED

a. ☑ pH All
b. ☐ Metal Scan
c. ☑ Metals (Spec) Cr(T), Fe, Mn, Na, Ca
d. ☐ W.E.T.
f. ☐ PCB
g. ☑ VOA
h. ☐ PAH
i. ☐ Phenols
j. ☐ Carbamates
k. ☐ Ext. Org (Screeng)
l. ☐ Chlorinated Pesticides
m. ☐ Organo-P Pesticides
n. ☑ TOC ALL
o. ☑ TOX ALL

☒ TDS - ALL ☒ Cl, SO4, PO4 (~~SP~~) as P

13. CHAIN OF CUSTODY

	Signature	Name/Title	Inclusive Dates
a.	G. R. Baker	G.R. Baker / Atkins	3/7/89 - 3/8/89
b.	Monica D. Ligas	Monica Ligas / P.H. Chem II	3/8/89 - 3/9/89
c.	Vernie Earl Woodson	VERNE EARL WOODSON / LAB ASST	3/16/89 - / /
d.			/ / - / /

14. SPECIAL REMARKS

15. RECEIVED BY Monica D. Ligas a. Title P.H. Chem II b. Date 3/9/89

16. SAMPLE ALLOCATION a. ☐ HML-Berkeley b. ☐ HML-SC c. ☐ AIHL d. ☐ Contract b. Date 3/16/89

Howard S. Okamoto PHC III

17. ANALYSIS REQUESTED

See Section 12 above

DHS 8002 (Rev 7/87) Original-Lab • Duplicate-File • Triplicate-Inspector NLY (HML)

MAR-15-89 12:40 ID:SO CALIF LAB TEL NO:8-640-2934 #525 P22

8571230S : # 2

APPENDIX M

Quarterly Monitoring Reports
for
Board Order No. 85-99

Pacific Gas and Electric Company

Pipe Line Operations,
Southern Area
22999 Community Boulevard
Hinkley CA
619-253-2991
Mailing Address
PO Box 1060
Barstow CA 92311

Robert A. Cook
Area Manager

RECEIVED
JAN 17 1989
REGION 7

January 11, 1989

1-30-8
SRC

Mr. Arthur Swajian
Executive Officer
California Water Quality Control Board -
Colorado River Basin, Region 7
73-271 Highway 111, Suite 21
Palm Desert, CA 92260

Dear Mr. Swajian:

Attention: Mr. Shasi Kumar

Re: Board Order 85-99

Attached are the quarterly monitoring reports for Topock Compressor Station for the period ending December 31, 1988.

If you have any questions regarding this report, please contact either me or Jeff McCarthy of my staff.

Sincerely,

R.A. Cook
Southern Area Manager,
Pipe Line Operations

Attachments

cc: Refuge Manager
Havasu National Wildlife Refuge
P.O. Box A
Needles, CA 92363

PACIFIC GAS AND ELECTRIC COMPANY

TOPOCK COMPRESSOR STATION

QUARTERLY REPORT

BOARD ORDER NO. 85-99

To comply with monitoring and reporting program no. 85-99 (Revised 12/5/85) issued by the California Regional Water Quality Control Board - Colorado River Basin, Region 7, the following report is submitted for the quarter ending December 31, 1988.

Table 1 contains wastewater monitoring data for the four evaporation ponds and Table 2 contains groundwater monitoring data.

Copy to: Refuge Manager
Havasu National Wildlife Refuge
P.O. Box A
Needles, CA 92363

TABLE 1

ANALYTICAL RESULTS OF SAMPLES COLLECTED FROM THE EVAPORATION PONDS AT TOPOCK COMPRESSOR STATION

POND	TOTAL DISSOLVED SOLIDS (mg/l)	pH (units)	SPECIFIC CONDUCTANCE (micromhos/cm)	TOTAL CHROMIUM (mg/l)	TOTAL PHOSPHORUS (mg/l)
#1	4,900	7.5	9,300	<0.1	0.2
#2	26,000	9.3	57,000	<0.1	0.1
#3	36,000	9.1	69,000	<0.1	<0.1
#4	38,000	8.9	70,000	<0.1	<0.1

The total quantity of wastewater delivered to the ponds during the quarter was 2,126,290 gallons.

TABLE 2

ANALYTICAL RESULTS OF SAMPLES COLLECTED FROM THE MONITORING WELLS
AT TOPOCK COMPRESSOR STATION

WELL NO. (LOCATION)	TOTAL DISSOLVED SOLIDS (mg/l)	pH (units)	SPECIFIC CONDUCTANCE (micromhos/cm)	TOTAL CHROMIUM (mg/l)	TOTAL PHOSPHORUS (mg/l)
MWP-3 (upgradient)	480	7.8	890	<0.01	0.07
MWP-12 (upgradient)	660	7.7	1,080	<0.01	0.10
MWP-8 (downgradient)	12,000	7.4	17,020	<0.01	0.12
MWP-9 (downgradient)	740	7.9	1,260	<0.01	0.20
MWP-10 (downgradient)	640	7.8	1,060	<0.01	0.09

Notes:

"<" means less than.

GEO MONITOR INC
Au Ag As Pb Ba Bi Co Cu Mn Hg Mo Cr Ni Ti Se Sn Pt Sc Pt As An

GEO-MONITOR, INC
P.O. BOX 1428 • Hesperia, California 92345
(619) 244-5481

Certificate of Analysis

Client: P. G. & E.
(FAX: 619-326-5542)

Date: 12-28-88

Lab #3049

______		Sample 1	Sample 2	Sample 3	Sample 4
pH		7.5	9.3	9.1	8.9
Cr (Total)	mg/L	0.2	0.1	<0.1	<0.1
F (Total)	mg/L	<0.1	<0.1	<0.1	<0.1
EC	µmho/cm	9,300	57,000	69,000	70,000
TDS	mg/L	4,900	26,000	36,000	38,000

S. Mark Clardy

S. Mark Clardy
Chief Chemist

Topock Water Level Data and Field Measurements

Well Number	Screened Interval (feet)	Well Total Depth (feet)	Borehole Total Depth (feet)	Depth to Bedrock (feet)	Top of Casing Elevation (feet)	Ground Surface Elevation (feet)	Water Level Data: Date	Water Level Data: Static Water Level (feet)	Water Level Data: Ground Water Elevation (feet)	Field Water Quality Data: Date Sampled	Field Water Quality Data: Field pH	Field Water Quality Data: Field Specific Conductance (umhos/cm)	Field Water Quality Data: Field Temperature (C)	Field Water Quality Data: Volume of Water Removed Before Sampling (gallons)
MWP-3	108-208	219.0	222.0	188	662.34	661.54	11/29/88	108.77	553.57	11/29/88	7.47	830	26.8	124.8
MWP-8	181-211	211.0	211.0	205	676.26	675.27	11/30/88	176.70	499.56	11/30/88	7.36	17250	29.0	46.7
MWP-9	179-219	220.0	220.0	215	682.12	681.02	11/29/88	190.46	491.66	11/29/88	7.47	1275	26.1	32.2
MWP-10	194-234	235.0	235.0	230	674.59	670.48	11/30/88	206.70	467.89	11/30/88	7.53	1000	26.6	33.0
MWP-12	96-136	142.0	143.0	130	662.3	660.49	11/29/88	105.32	556.98	11/29/88	7.35	1050	26.3	32.8
P-1	171-211	217.0	217.0	205	695.76	694.59	11/30/88	156.73	539.03	11/30/88	7.51	930	25.9	68.1

All wells constructed of 3-inch diameter Schedule 80
PVC pipe and slotted casing. Slot size 0.010 inch.
Top of casing elevations measured from top of Well Wizard mounting plate.

BROWN AND CALDWELL LABORATORIES
[illegible]

ANALYTICAL REPORT

LOG NO: E88-12-053

Received: 02 DEC 88
Reported: 20 DEC 88

Mr. Pat Viegand
Brown and Caldwell
3480 Buskirk Avenue
Pleasant Hill, California 94523

Project: 3410-01

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED
12-053-8	P-1	01 DEC 88
12-053-9	MWP-3	01 DEC 88
12-053-10	MWP-8	01 DEC 88
12-053-11	MWP-9	01 DEC 88
12-053-12	MWP-10	01 DEC 88

PARAMETER	12-053-8	12-053-9	12-053-10	12-053-11	12-053-12
Hexavalent Chromium, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Hex Chromium, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Total Coliform, MPN/100mL	<2	<2	<2	<2	<2

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-12-053

Received: 02 DEC 88
Reported: 20 DEC 88

Mr. Pat Wiegand
Brown and Caldwell
3480 Buskirk Avenue
Pleasant Hill, California 94523

Project: 3410-01

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED
12-053-13	MWP-12	01 DEC 88
12-053-14	MWP-13	01 DEC 88

PARAMETER	12-053-13	12-053-14
Hexavalent Chromium, mg/L	<0.01	<0.01
Dissolved Hex Chromium, mg/L	<0.01	<0.01
Total Coliform, MPN/100mL	<2	<2

BROWN AND CALDWELL LABORATORIES

ANALYTICAL REPORT

LOG NO: E88-12-053

Received: 02 DEC 88
Reported: 20 DEC 88

Mr. Pat Viegand
Brown and Caldwell
3480 Buskirk Avenue
Pleasant Bill, California 94523

Project: 3410-01

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, BLANK WATER SAMPLES	DATE SAMPLED
12-053-15	Trip Blank	28 NOV 88

PARAMETER	12-053-15		
Hexavalent Chromium, mg/L	<0.01		
Total Organic Carbon (TOC), mg/L	0.74		
Total Organic Halides (TOX), mg/L	<0.025		

Sim D. Lessley, Ph.D., Laboratory Manager

ATTACHMENT B

DECEMBER 1988 STATISTICAL ANALYSES

STATISTICAL ANALYSIS USING MWF-12 AS BACKGROUND
DECEMBER 1988 DATA

TOPOCK COMPRESSOR STATION

Two-tailed t-test for variation in pH
Significance Level of 1.0 percent

Background Mean:	7.505
Background Variance:	.020
Number of Analyses:	16
Coefficient of Variation:	.019

Monitor Well	Mean	Variance	Number of Analyses	Calculated t Value	Table t Value	Significant Difference
MWP-8	7.450	.003	6.000	-.682	2.878	No
MWP-9	7.925	.003	6.000	5.817	2.878	Yes

TOPOCK COMPRESSOR STATION

Single-tailed t-test for variation in SC
Significance Level of 1.0 percent

Background Mean:	1183
Background variance:	67831
Number of Analyses:	16.000
Coefficient of Variation:	.221

Monitor Well	Mean	Variance	Number of Analyses	Calculated t Value	Table t Value	Significant Difference
MWP-8	17018	81758.3	6.000	106.984	2.552	Yes

COCHRAN'S APPROXIMATION OF THE BEHREN-FISHER STUDENT'S T-TEST
STATISTICAL ANALYSIS USING MWP-12 AS BACKGROUND
DECEMBER 1982 DATA

TOPOCK COMPRESSOR STATION

Two-tailed t-test for variation in pH
Significance Level of 1.0 percent

Background Mean:	7.500
Background Variance:	.020
Number of Analyses:	16
Coefficient of Variation:	.019

Monitor Well	Mean	Variance	Number of Analyses	t*	t(c)	Significant Difference
MWP-10	7.800	.000	4.000	8.485	2.967	Yes
MWP-12	7.700	.000	4.000	5.657	2.967	Yes

TOPOCK COMPRESSOR STATION

Single-tailed t-test for variation in SC
Significance Level of 1.0 percent

Background Mean:	1120
Background Variance:	67801
Number of Analyses:	16.000
Coefficient of Variation:	.221

Monitor Well	Mean	Variance	Number of Analyses	t*	t(c)	Significant Difference
MWP-9	1260	867	4.000	1.199	2.696	No
MWP-10	1060	200	4.000	-1.833	2.625	No
MWP-12	1080	667	4.000	-1.515	2.654	No

COCHRAN'S APPROXIMATION OF THE BEHREN-FISHER STUDENT'S T-TEST
STATISTICAL ANALYSIS USING MWP-12 AS BACKGROUND
DECEMBER 1988 DATA
VALUES BELOW THE DETECTION LIMIT SET EQUAL TO THE LIMIT

TOPOCK COMPRESSOR STATION

Single-tailed t-test for variation in TOX
Significance Level of 1.0 percent

Background Mean:	.100
Background Variance:	.010
Number of Analyses:	16.000
Coefficient of Variation:	1.000

Monitor Well	Mean	Variance	Analyses	t*	t(c)	Significant Difference
MWP-8	.076	.00001	6.000	-.958	2.610	No
MWP-9	.025	.00000	4.000	-3.000	2.602	No
MWP-10	.025	.00000	4.000	-3.000	2.602	No
MWP-12	.025	.00000	4.000	-3.000	2.602	No

TOPOCK COMPRESSOR STATION

Single-tailed t-test for variation in TOC
Significance Level of 1.0 percent

Background Mean:	5.100
Background Variance:	2.300
Number of Analyses:	16.000
Coefficient of Variation:	.297

Monitor Well	Mean	Variance	Number of Analyses	t*	t(c)	Significant Difference
MWP-8	.250	.003	6.000	-12.755	2.613	No
MWP-9	.500	.000	4.000	-12.133	2.602	No
MWP-10	.500	.000	4.000	-12.133	2.602	No
MWP-12	.600	.007	4.000	-11.800	2.624	No

COCHRAN'S APPROXIMATION OF THE BEHREN-FISHER STUDENT'S T-TEST
STATISTICAL ANALYSIS USING MWF-12 AS BACKGROUND
DECEMBER 1988 DATA
VALUES BELOW THE DETECTION LIMIT SET EQUAL TO 1/2 OF THE LIMIT

TOPOCK COMPRESSOR STATION

Single-tailed t-test for variation in TOX
Significance Level of 1.0 percent

Background Mean:	.056
Background Variance:	.003
Number of Analyses:	16.000
Coefficient of Variation:	.913

Monitor Well	Mean	Variance	Number of Analyses	t*	t(c)	Significant Difference
MWP-8	.076	.00001	6.000	1.557	2.631	No
MWF-9	.013	.00003	6.000	-3.412	2.602	No
MWF-10	.013	.00000	6.000	-3.412	2.602	No
MWF-12	.013	.00000	6.000	-3.412	2.602	No

TOPOCK COMPRESSOR STATION

Single-tailed t-test for variation in TOC
Significance Level of 1.0 percent

Background Mean:	3.813
Background Variance:	5.463
Number of Analyses:	16.000
Coefficient of Variation:	.613

Monitor Well	Mean	Variance	Number of Analyses	t*	t(c)	Significant Difference
MWP-8	.250	.003	6.000	-6.091	2.607	No
MWP-9	.250	.000	6.000	-6.098	2.602	No
MWP-10	.250	.000	6.000	-6.098	2.602	No
MWF-12	.600	.007	6.000	-5.685	2.611	No

APPENDIX N

Waste Discharge Requirements
for
Board Order No. 85-99

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION

ORDER NO. 85-99

WASTE DISCHARGE REQUIREMENTS
FOR
PACIFIC GAS AND ELECTRIC COMPANY
TOPOCK COMPRESSOR STATION
Southeast of Needles - San Bernardino County

The California Regional Water Quality Control Board, Colorado River Basin Region, finds that:

1. Pacific Gas and Electric Company (hereinafter also referred to as the discharger), 77 Beale Street, San Francisco, California, 94106, submitted a Report of Waste Discharge dated August 21, 1985, to discharge industrial wastewater from a natural gas compressor station located one-half (½) mile west of the Colorado River, across from Topock, Arizona.

2. The discharger is presently discharging a maximum of 30,000 gallons-per-day of industrial wastewater to four (4) evaporation basins in the SW¼, Section 8, T7N, R24E, SBB&M. A general location map is shown as Attachment "A" appended hereto as a part of this Order.

3. The wastewater discharged is primarily cooling tower blowdown, but also contains a small amount of wastewater from other miscellaneous plant operations. Presently, the cooling tower blowdown contains added chromates (used for corrosion control) and has a total dissolved solids concentration of approximately 6,500 mg/L.

4. The discharge has been subject to waste discharge requirements adopted in Order No. 75-52 (Revised). The disposal of any remaining chromic hydroxide sludge residue (from flocculation or evaporation of cooling tower blowdown) is subject to waste discharge requirements adopted in Order No. 70-73.

5. The discharger proposes to replace the hazardous chromate-based cooling tower water treatment process currently in use with a nonhazardous phosphate-based water treatment process (Betz Dianodic II Treatment Program). The Dianodic II Treatment Program is an organic treatment process that reportedly produces no hazardous waste.

6. The Dianodic II treatment process consists of the following products which are added to the cooling tower makeup water to prevent corrosion, scaling and fouling of the heat exchangers and cooling tower structure.

   a. Betz 2020: A scale inhibitor composed of a low molecular weight polymer. Treatment level - 60 ppm.

   b. Betz 2040: A corrosion inhibitor composed of ortho - and polyphosphates. Treatment level - 80 ppm.

c. Betz C-63P: A nonoxidizing biocide designed to control microbiological growth. Treatment level - 2 ppm.

d. Betz C-30: A nonoxidizing biocide designed to control microbiological growth. Treatment level - 25 ppm.

e. Sulfuric Acid: Used to lower the pH to inhibit scaling.

7. Domestic sewage from employee working areas is disposed of by means of septic tank and leach field systems.

8. The Water Quality Control Plan for the Colorado River Basin Region was adopted by the Regional Board on November 14, 1984. The Basin Plan contains water quality objectives for the Colorado River Hydrologic Unit.

9. The beneficial uses of the waters to be protected are:

a. Surface Waters: The nearest surface water is the Colorado River, located approximately one-half (½) mile east of the evaporation basins. The beneficial uses of the Colorado River below the Needles-Topock Bridge are:

1. Municipal supply
2. Agricultural supply
3. Industrial supply
4. Ground water recharge
5. Contact and noncontact water recreation
6. Warm freshwater habitat
7. Wildlife habitat
8. Hydropower generation
9. Preservation of rare and endangered species.

b. Ground Water: Ground water in the vicinity of the compressor station is not presently being used. Recent analysis of ground water from a monitoring well located on the plant site, approximately 1,000 feet from the evaporation basins, show TDS concentration between 2,000 and 20,000 mg/L. Ground water elevation is approximately 460 feet above mean sea level. The bottom of the lowermost evaporation basin is 670 feet above mean sea level.

10. The discharger states that the nonhazardous phosphate-based treatment process produces wastewater with total dissolved solids (TDS) concentration of approximately 1,400 mg/l with a pH of approximately 8.0. The surface impoundments contain approximately 28,000 mg/l TDS concentration with a pH of approximately 8.0.

11. Pacific Gas and Electric Company plans to submit, by November 8, 1985, a closure plan for all hazardous waste facilities at Topock Compressor Station including the surface impoundments, in compliance with Subchapter 15, Chapter 3, Title 23, of the California Administrative Code.

12. Pacific Gas and Electric Company reports that upon closure, the existing surface impoundments will be reconstructed as Class II surface impoundments in accordance with Subchapter 15, Chapter 3, Title 23, of the California Administrative Code.

13. The Board has notified the discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for the proposed discharge.

14. The Board in a public meeting heard and considered all comments pertaining to the discharge.

15. These waste discharge requirements govern an existing facility, which the discharger is currently operating, and therefore is exempt from the provisions of the California Environmental Quality Act in accordance with Section 15301 of Title 14, Chapter 3, of the California Administrative Code.

IT IS HEREBY ORDERED, Pacific Gas and Electric Company shall comply with the following:

A. Discharge Specifications

1. Neither the treatment nor the discharge of wastes shall create a pollution or a nuisance as defined in Division 7 of the California Water Code.

2. The discharge of industrial wastewater shall be confined to the evaporation basins shown on Attachment "B" appended hereto as a part of this Order.

3. A minimum freeboard depth of at least one (1) foot shall be maintained at all times in each basin.

4. Measures shall be taken to assure that wastewater discharged to the basins shall not overflow.

5. Adequate protective works shall be provided to assure that flood or surface drainage water do not erode or otherwise render portions of the disposal facilities inoperable.

6. Remaining chemical residues containing chromates obtained by chemical flocculation or evaporation of process wastewaters shall be discharged only at a solid waste disposal site approved by the Board to receive such wastes.

7. The discharger shall implement and maintain the Dianodic II Treatment Program as specified in the above Finding No. 6.

B. Prohibitions

1. The discharge of wastewaters to Colorado River or to any channel draining to Colorado River is prohibited.

2. The use of hazardous chemicals including chromates in the cooling tower water treatment process is prohibited.

C. Provisions

1. The discharger shall maintain a copy of this Order at the site to be available at all times to site operating personnel.

2. The discharger shall comply with "Monitoring and Reporting Program No. 85-99", and future revisions thereto, as specified by the Executive Officer.

3. Prior to any modifications in this facility which could result in material change in quality or quantity of wastewater discharged, or any material change in location of discharge, the discharger shall report thereon to the Regional Board.

4. In the event of any change in operation, or in control or ownership of land or waste disposal facilities owned or controlled by the discharger, the discharger shall:

   a. Notify the Regional Board in writing of such change; and

   b. Notify the succeeding owner or operator in writing of the existence of this Order; a copy of which shall be filed with this Board.

5. This Order does not authorize violation of any federal, state or local laws or regulations.

6. This Order supersedes Board Order No. 75-52 (Revised).

I, Arthur Swajian, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Colorado River Basin Region, adopted on October 2, 1985.

Arthur Swajian

Executive Officer

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION

MONITORING AND REPORTING PROGRAM NO. 85-99 (REVISED 12/5/85)
FOR
PACIFIC GAS AND ELECTRIC COMPANY
TOPOCK COMPRESSOR STATION
Southeast of Needles - San Bernardino County

Location of Discharge: SW¼, Section 8, T7N, R24E, SBB&M

MONITORING

Pacific Gas and Electric Company shall report monitoring data to the Regional Board in accordance with the following schedule:

A. Evaporation Basin Wastewater Monitoring

1. Discharge wastewater samples shall be taken from each evaporation basin. Pacific Gas and Electric shall report monitoring data to the Regional Board in accordance with the following:

Constituents	Units	Sampling Frequency
Total Dissolved Solids (TDS)	mg/l	Quarterly
pH	pH Units	Quarterly
Specific Conductance	micromhos/cm	Quarterly
Total Chromium	mg/l	Quarterly
Total Phosphrous	mg/l	Quarterly
Total Wastewater Delivered to Ponds	Gallons	Quarterly

B. Ground Water Monitoring

1. The discharger shall obtain representative samples of ground water from each ground water monitoring well and analyze for the following constituents:

Constituent	Unit	Sampling Frequency
Total Dissolved Solids (TDS)	mg/l	Quarterly
pH	pH Units	Quarterly
Specific Conductance	micromhos/cm	Quarterly
Total Chromium	mg/l	Quarterly
Total Phosphorus	mg/l	Quarterly

Monitoring reports shall be submitted to the Regional Board by January 15, April 15, July 15 and October 15 of each year.

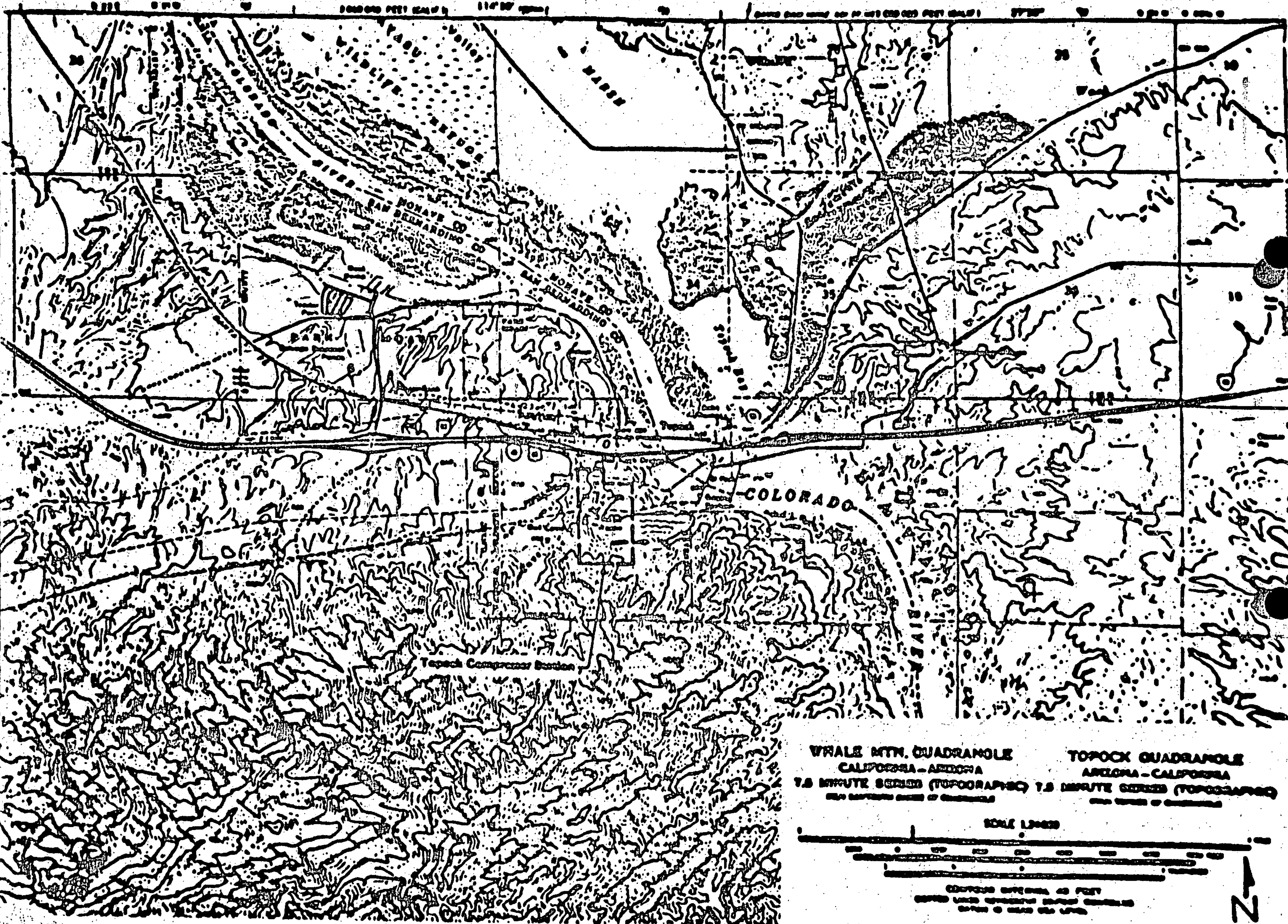
The discharger shall implement the above monitoring program within 30 days following the effective date of this Order.

Forward monitoring reports to:

California Regional Water Quality Control Board
Colorardo River Basin Region
73-271 Highway 111, Suite 21
Palm Desert, CA 92260

Executive Officer

December 5, 1985
Date


COLORADO
MOHAVE CO
SAN BERNARDINO CO
Topock Compressor Station
WHALE MTN. QUADRANGLE
CALIFORNIA - ARIZONA
7.5 MINUTE SERIES (TOPOGRAPHIC)
TOPOCK QUADRANGLE
ARIZONA - CALIFORNIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
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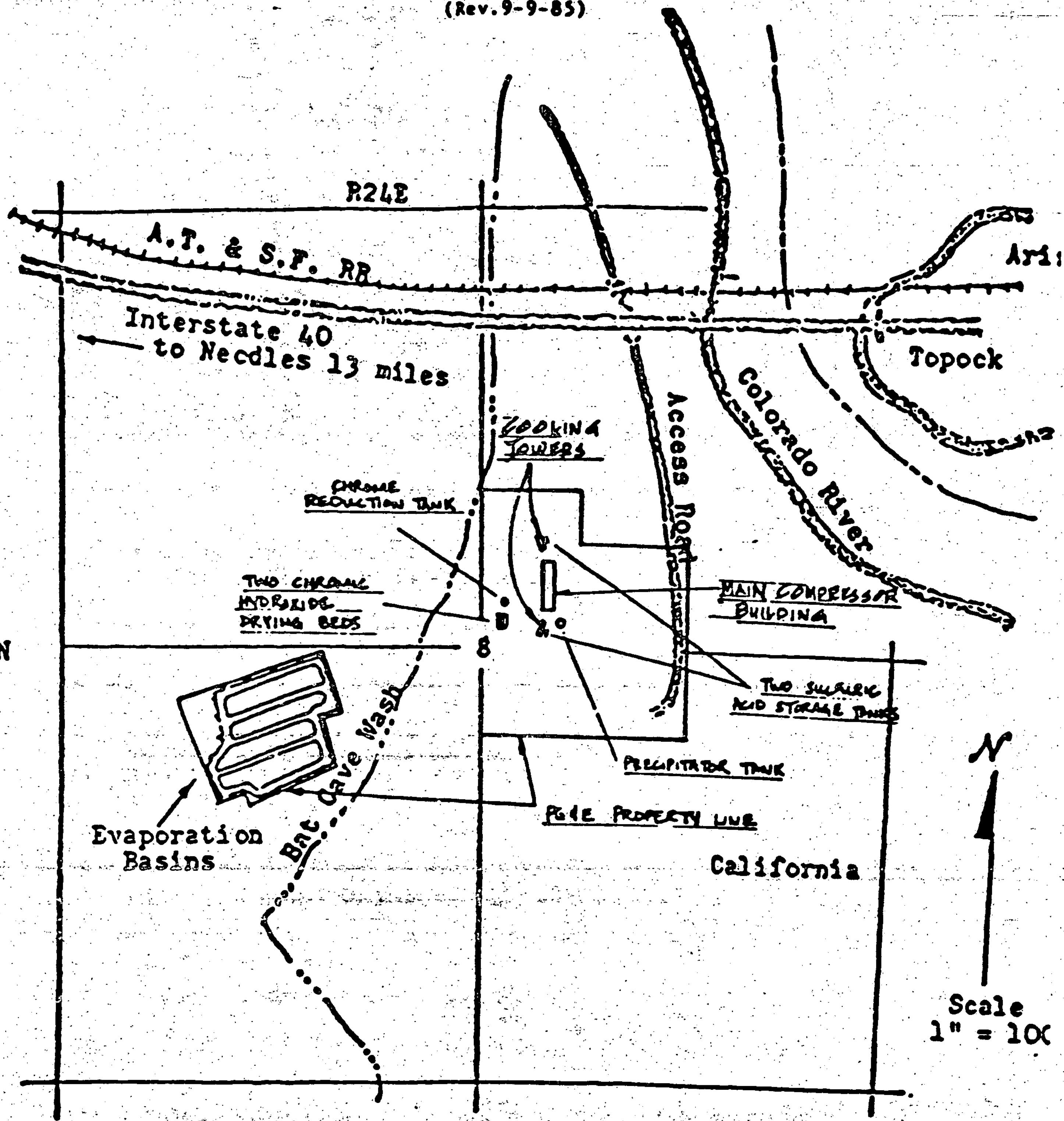
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD - REGION 7

ATTACHMENT "B"
(Rev. 9-9-85)



SITE MAP

PACIFIC GAS AND ELECTRIC COMPANY - TOPOCK COMPRESSOR STATION
Southeast of Needles - San Bernardino County

Evaporation Basins in SW¼, Section 8, T7N, R24E, SBB&M

TABLE 3

CHARACTERIZATION OF HAZARDOUS WASTE MANAGEMENT FACILITIES AT TOPOCK COMPRESSOR STATION

The following information is based on analytical results of samples taken in October 1984.

Evaporation Ponds

	Total Chromium (mg/kg)	Hexavalent Chromium (mg/kg)
Sludge/Soil Samples		
Pond #1	1300	* 2
Pond #2	300	3
Pond #3	1620	* 1
Pond #6	1200	* 6
Water[1]		
Pond #3	0.59 mg/l	0.24 mg/l

Cooling Towers and Treatment Tanks

	Total Chromium (mg/l)	Hexavalent Chromium (mg/l)
Cooling Tower A	7.8	6
Cooling Tower B	2.6	0.62
Chromate Reduction Tank	23.0	0.40
Precipitation Tank (Water)	3.8	0.04
Precipitation Tank (Sludge)	37,300 mg/kg	4 mg/kg

*Indicates "less than"

[1] At the time samples were taken, only Pond #3 contained water.

CLARENCE

GEORGE: YOU MAY WANT THIS CB

June 27, 1989

Ray Campbell, HMS
Facility Permitting Unit
Region 4 (Long Beach)

Soils Sampling
During Closure of the
Topock Surface
Impoundments

AAA! of Proposed Plan.

Elizabeth Lafferty, Engineering Geologist
Technical & Support Services Unit
Region 4 (Long Beach)

GENERAL COMMENTS:

1. A Sampling and Analysis Plan for soils, sediments, rock material and any ground water sampled should be included listing EPA methods or a standard method for performing sampling and analysis as well as QA/QC for the sampling and laboratory methods used.

2. The geologic structure, general geology and hydrology of the site are not completely known. Therefore, the borings completed must be continuously sampled and logged. This may be accomplished by using the dual wall air percussion method with the cuttings being bagged for a nearly continuous log.

Metal contaminants by nature travel with infiltrating meteoric water or ground water and are precipitated at different depths under different conditions. It is recommended that a rationale for installation of a minimum of one upgradient and three downgradient borings be drilled to ground water to perform continuous sampling on soils, sediments, and rock. These borings can then be completed as monitoring wells or simply as piezometers to measure ground water levels (5-10' well screens). Each boring or monitoring well borehole should be E. Logged, gamma logged, caliper logged and correlated to continuous coring data (and then correlated with all other wells). All wells which have not been gamma logged should be. Plans should include rationale and design for abandonment of boreholes or unusable monitoring wells or piezometers.

piezometers are installed, plans should be included for additional piezometers in the same areas to test for vertical gradient and/or interconnection of the saturated zones, plus ground water flow direction. Rationale for screen placement, screen slot size and filter pack size should be included.

Complete cross sections should be drawn from data gained from these borings. These sections should be adequately detailed and at a scale that shows geologic features and structure beneath the waste ponds. (One inch = 100 feet would be adequate.)

Plans should be submitted for completion of pump, slug or piezometer tests and/or aquifer tests to assess the hydraulic conductivity, transmissivity, storage coefficient and leakage or indication of interconnection of the aquifers.

SB

SPECIFIC PAGE and PARAGRAPH COMMENTS:

PAGE 1/PARA. 1 (Letter Page)

The plan for sampling locations should clearly state which method will be used at which location along with the rationale for choosing that method.

If there is a necessity for a change in sampling technique, state the trigger point for the change and the rationale for that trigger. Then a phone conversation with DHS staff will be sufficient to note that the change in plans has taken place.

PAGE 1/PARA. 1 Sampling Methods

Metals as contaminants very often are carried in solution by ground water or are driven by leakage from any impoundment through the unsaturated zone without deposition to the saturated zone where they may be precipitated due to a change in some parameter such as pH, rate of flow of ground water or another chemical or physical characteristic of the zone.

Therefore, the objective of the sampling plan should not only be to sample the unsaturated zone, but also the saturated zone particularly at its interface with the vadose zone's capillary zone.

Since the site is characterized by poorly graded sands, gravels and boulders it is agreed that core samples may be impractical. Two methods of possible sample recovery may be air rotary with casing hammer or cable tool methods. Since the objective of sampling is to find metals not organics or volatiles, these methods yielding disturbed samples would be acceptable. Several geologists and helpers will be necessary to catch, bag, label and log each sample.

PAGE 2/PARA.1

PG & E may wish to use the hand sampling method for the first 5 feet, and the hollow stem auger method for the next 20-30 feet, however the stratigraphic and structural nature and the lithology of the sediments and rock must be sampled and delineated to ground water, to bedrock and into bedrock as deeply as possible up to 25' in order to discern any fracturing or visible faulting or jointing which should eventually be investigated as a possible contaminated pathway.

Therefore, it will be much less expensive to utilize a rig which can drill the whole section as quickly and effectively as possible.

A mining coring device may be considered for drilling into bedrock for study of fracturing/jointing as necessary.

7-26-89- begin

PAGE 3/PARA 1 DEPTHS FOR SAMPLING AND ANALYSIS

Since the purpose of this coring and sampling is mainly to determine the lithology and structure of the area, it would be sufficient to obtain a sample from each 5 foot interval, composite them and run one sample for metals from each borehole.

Since the original samples will be retained, it can be determined after the first set of metals samples are run, whether additional samples need to be run and for which metals.

PAGE 4/PARA. 1

Background locations should be sited in Bat Cave Wash in order to encounter any previous run-off in that direction.

Background locations will also assess the possible occurrence of natural chromium in the area. They will also assist in location of a possible fault in the area, and possible underflow in an unexpected direction under the site.

PAGE 6/PARA. 1 SUMMARY

The sampling plan is deficient in that it has not proposed E-logs on the proposed borings and old monitoring wells in as far as is possible. Gamma logs on all wells/boreholes old and new to correlate with new lithologic information would be desirable.

Due to the geologic and physiographic constraints at the site, the number of background borings should be increased not decreased. However, additional borings will need to be sited for specific rationale and that rationale should be stated clearly for each boring.

Analysis for total chromium, pH, nickel, zinc and copper will be adequate if it represents the total range of metals used in treatment processes at the site. If chromium is detected, then chromium VI should be the object of the next phase of analysis.

As stated in comments on page 2/paragraph 6, the borings should extend to bedrock and should analyze for the total metals used in treatment processes at the site which would possibly have been released into the subsurface. The samples taken every 5 feet can be stockpiled and a composite sample can be analyzed for those metals for each borehole.

If any borehole shows any level of those metals then the analysis may proceed in phases, analyzing every 20 foot interval in three dowgradient borings and one upgradient boring for the same metals analysis. When any analysis has a "show", then the rate of analysis can be increased to every 5-foot interval within that of the "show" in order to locate the extent of any plume.

STATE OF CALIFORNIA
HEALTH AND WELFARE AGENCY
DEPARTMENT OF HEALTH SERVICES
TOXIC SUBSTANCES CONTROL DIVISION

In the Matter of: Pacific Gas and Electric Company, Topock Compressor Station Respondent	Docket No. HWCA 87/88-018 STIPULATION AND ORDER Health and Safety Code Section 25187

The State Department of Health Services ("Department" or "DHS") and Pacific Gas and Electric Company ("Respondent") agree as follows:

1.1. Respondent owns and operates a hazardous waste management facility located 15 miles east of Needles, California, on Interstate 40, San Bernardino County. (Map attached as Exhibit 1.)

1.2. The Department authorized Respondent to manage hazardous waste by interim status document number CAT080011729 issued on April 6, 1981.

1.3. Respondent does not admit or agree with the allegations made in the Statement of Facts or the Allegations of Violations (Sections II and III) of this Order. Nothing in this Order shall constitute an admission of liability with respect to matters set forth herein.

1.4. The parties wish to avoid the expense of further litigation and to ensure prompt action to achieve the schedule of compliance below.

1.5. Jurisdiction exists pursuant to Section 25187 and/or 25188 of the Health and Safety Code.

1.6. Respondent knowingly and intelligently waives any right to a hearing in matter.

1.7. This Stipulation and Order shall constitute full settlement of the violations alleged in this Order.

1.8. All exhibits attached to this Order are incorporated herein by this reference.

1.9. Reference Documents. The following list are those documents which will be referenced throughout the Order:

1.9.1. GCA Corporation Technical Division Inc., "Technical Review of Documents; PG&E Topock Compressor Station," Letter Report dated February, 1986 (under contract to EPA);

1.9.2. PG&E Department of Engineering Research, "Construction, Development & Sampling of Topock Compressor Station RCRA Ground Water Monitoring Wells," dated August 1, 1986;

1.9.3. CA Regional Water Quality Control Board, Colorado River Basin Region, "RCRA Evaluation Report," dated October 17, 1986;

1.9.4. CA Regional Water Quality Control Board, Colorado River Basin Region, "Staff Comments on PG&E Topock's Revised Closure Plan & Revised Ground Water Monitoring Report," dated January 29, 1987;

1.9.5. Brown & Caldwell Inc., "Water Quality Evaluation, RCRA Ground Water Monitoring System, PG&E Topock," dated January, 1987 (under contract to PG&E);

1.9.6. Letter from Victor Furtado, Ph.D., PG&E, to Angelo Bellomo, DHS, entitled "Topock Compressor Station Ground Water Monitoring Program," dated January 30, 1987;

1.9.7. A. T. Kearney, Inc., "RCRA Facility Assessment, PG&E Topock Compressor Station, Needles, CA," dated August, 1987 (under contract to EPA);

1.9.8. Brown & Caldwell, Inc., "Reports of Analytical Results," three (3) dated December, 1986, March, 1987, and June, 1987 (under contract to PG&E).

//

II. STATEMENT OF FACTS

2.1. Respondent is a privately owned public utility providing electric, gas and steam services in California.

2.2. Respondent owns and operates a hazardous waste management facility located 15 Miles East of Needles, California, on Interstate 40, San Bernardino County, known as the "Topock Compressor Station."

2.3. On or about November 19, 1980, Respondent filed a "Part A" application with the United States Environment Protection Agency (EPA) pursuant to Section 3005 of RCRA, in which Respondent stated that it generates, treats, stores or disposes of hazardous waste identified or listed under Subtitle C of RCRA and Title 40, Code of Federal Regulations (40 CFR) Part 261. The "Part A" states that the facility manages hazardous wastes identified as D002 (solid waste that exhibits the characteristic of corrosivity), D007 (solid waste that contains concentrations of chromium equal to or greater than 5 mg/1).

2.4. Respondent is subject to the interim status standards for owners and operators of hazardous waste facilities (40 CFR Part 265). The "Part A" is also the initial permit application filed by owners and operators of hazardous waste facilities with the Department as provided for in Title 22, California Administrative Code Sections 66151 and 66390.

2.5. On or about April 6, 1981, the Department issued interim status document (ISD) number CAT080011729.

2.6. Respondent is required, as a condition of its ISD and also pursuant to 40 CFR Part 265, Subpart F, to implement a groundwater monitoring program for its land disposal units which complies with specific requirements provided therein.

2.7. In February of 1986, GCA Corporation Technology Division, Inc. (GCA), under contract to the US Environmental Protection Agency (EPA) to provide a technical review of the ground water monitoring documents pertaining to Topock Compressor Station required by 40 CFR Part 265, Subpart F, submitted the document referenced in Paragraph 1.9.1 to EPA and the Department.

2.8. That document disclosed following deficiencies:

2.8.1. The facility had not identified the uppermost aquifer; site characterization had not been done to justify the placement of monitoring wells; and the vertical gradient at the site and the degree of hydraulic interconnection between formations had not been determined.

2.8.2. Site hydrology was inadequately characterized, making it impossible to determine whether monitoring wells have been adequately placed to assure that any hazardous waste constituents which may migrate from the waste management area to the uppermost aquifer are detected;

2.8.3. Hydraulic conductivities had not been determined, nor were vertical gradients defined, which information is necessary to assess groundwater flow paths, to define zones of potential migration and to determine the degree of interconnection between stratigraphic units at the site;

2.8.4. The designated upgradient and downgradient wells had not been shown to be screened within the same stratigraphic horizon;

2.8.5. The designated downgradient wells were spaced too far apart to insure detection of leaks from hazardous waste management units which may otherwise be undetected;

2.8.6. The required number of designated downgradient wells had not been installed at the site.

2.8.7. The monitoring wells were inconsistently and improperly screened.

2.8.8. The sampling and analysis plan did not contain specific procedures and techniques.

2.8.9. In analytical data obtained from samples collected in December, 1985, fourth replicate values were not reported for TOC on any of the wells.

2.8.10. The December, 1985 report for well MWP-9 (Table 3) contained no value for static water elevation. There was also a discrepancy in Table 3 in that a value is provided for groundwater elevation during pumping, yet a footnote stated that there was no measurement of pumping water elevation.

2.8.11. Analyses for two parameters, mercury and coliform bacteria, were not provided, which are necessary to characterize the suitability of the groundwater for a drinking water supply. (This was later corrected, as noted in the document referenced in Paragraph 1.9.5.)

2.8.12. The outline of a groundwater quality assessment program does not describe a comprehensive groundwater program which is capable of determining:

a) Whether hazardous waste or hazardous waste constituents have entered the ground water;

b) The rate and extent of migration of these constituents; or

c) The concentration of these constituents in the groundwater.

2.9. Respondent has partially addressed these deficiencies in the document referenced in Paragraph 1.9.2.

2.10. The Colorado River Basin Regional Water Quality Control Board (CRBRWQCB), under contract to DHS to provide a technical review of groundwater monitoring programs, conducted a Comprehensive Monitoring Evaluation (CME) on August 20, 1986, of the Topock Compressor Station's ground water monitoring system. The CRBRWQCB summarized the results of the CME in the document referenced in Paragraph 1.9.3. In addition, the CRBRWQCB provided comments on the document referenced in Paragraph 1.9.2 in the document referenced in Paragraph 1.9.4.

The CRBRWQCB found the ground water monitoring system deficient as follows:

2.10.1 The uppermost aquifer had not been identified; hydraulic interconnections between formations had not been evaluated; and vertical gradients, hydraulic conductivity, permeability, and storage coefficient had not been determined.

2.10.2. Site characterization had not been done to justify the well locations, screened interval, slot size, and filter pack determination. More specifically;

a) The site hydrogeology had not been adequately characterized to determine the required number, proper placement, correct depth of screens, and appropriate screen length of the monitoring wells.

b) The designated upgradient and downgradient wells had not been screened within the same hydrostratigraphic horizon.

c) Designated downgradient wells were spaced too far apart to insure detection of leaks from hazardous waste management units which may otherwise be undetected.

d) Monitoring wells were inconsistently and improperly screened.

2.11. A further response was submitted by Respondent in the letter referred to in Paragraph 1.9.6.

2.12. On August 14, 1986, Respondent submitted to the Department, EPA, and CRBRWQCB, for review and approval, a revised Closure Plan pursuant to 40CFR Part 265.

2.13. On July 7, 1987, the Department, EPA, and CRBRWQCB approved Respondent's Closure Plan, with the condition that more adequate information be collected to determine if residual contamination will exist after closure activities have been completed. Respondent received this formal approval on September 7, 1987.

2.14. Respondent has argued that the ground water monitoring requirements described in 40 CFR, Part 265, Subpart F are not appropriate for the facility, given its specific geologic and climatic location. The Department has not decided on the merits of this argument.

III. ALLEGATIONS OF VIOLATIONS

3. The Department alleges that Respondent has violated, is violating, or threatens to violate various state and federal statutes and regulations as follows:

3.1. Respondent violated 40 CFR Section 265.90(a) and (b) in that its ground water monitoring system is not capable of determining the facility's impact on the quality of ground water in the uppermost aquifer underlying the facility.

3.2 Respondent violated 40 CFR Section 265.91(a) in that its ground water monitoring system is incapable of yielding ground water samples that adequately represent background and down gradient water quality.

3.3. Respondent violated 40 CFR Section 265.91(c) in that the monitoring wells have been improperly and inadequately screened.

3.4. Respondent violated 40 CFR Section 265.92(a) in that the sampling and analysis plan does not contain specific procedures and techniques for sample collection, sample preservation and shipment, analytical procedures, and chain of custody control.

3.5. Respondent violated 40 CFR Section 265.92(b)(1) in that ground water samples were not analyzed for mercury and coliform bacteria.

3.6. Respondent violated 40 CFR Section 265.92(c) in that fourth replicate measurements were not obtained for Total Organic Carbon (TOC) in any of the wells prior to March of 1986.

3.7. Respondent violated 40 CFR Section 265.92(e) in that the static water elevation was not obtained at the time of sampling as referenced in Table 3 of the document referenced in Paragraph 1.9.1.

3.8. Respondent violated 40 CFR Section 265.93(a) in that Respondent's outline of a ground water quality assessment program does not describe a more comprehensive program capable of determining: a) Whether hazardous waste or hazardous waste constituents have entered the ground water; b) The rate and extent of migration of these constituents; or c) The concentration of these constituents in the ground water.

IV. SCHEDULE OF COMPLIANCE

4. Based on the foregoing STATEMENT OF FACTS and ALLEGATIONS OF VIOLATIONS, IT IS HEREBY ORDERED THAT:

4.1. Respondent shall continue to implement its approved closure plan and pursue approval of a closure-verification sampling plan with the Department's Facility Permitting Unit. Upon approval of the closure-verification sampling plan, Respondent shall undertake to implement the plan. If the results from the closure-verification sampling indicate that a release of hazardous waste from the surface impoundments has occurred, Respondent shall implement a post-closure ground water monitoring system as described in 40 CFR Part 265. (If, upon completion of closure activities by Respondent, the Department determines that a post-closure permit is necessary, this ground water monitoring system shall be modified to conform to standards described in 40 CFR Part 264, and Respondent shall proceed to apply to the Department for such post-closure permit.)

4.2. If this ground water monitoring system is required, the Department shall notify Respondent of this requirement and, within sixty (60) days of the notification by the Department, Respondent shall develop and submit to the Department a post-closure ground water monitoring plan. The Department will consider site specific climatic and geologic factors in its evaluation of this plan. This plan shall be in accordance with the following requirements:

4.2.1. The ground water monitoring program must be capable of determining the facility's impact on the quality of groundwater in the uppermost aquifer underlying the facility. The plan must include the following items:

a) A description and map of proposed new well locations.

b) A rationale for the selection of the number, locations and depths of the proposed new wells. This rationale must include: (1) an interpretation of the groundwater flow system, including the vertical and horizontal components of flow; (2) an interpretation of the man-made influences that may affect groundwater flow; and (3) an interpretation of the direction of groundwater flow and its temporal variability.

c) The procedures which will be followed in drilling, constructing, developing and completing the wells including: (1) the presence of a qualified geologist or geotechnical engineer to log and describe the materials and conditions encountered during drilling; and (2) the performance of grain size distribution analyses for selection of the filter pack and screen slot size which are compatible with the formation.

d) A description and schematic diagram(s) of the proposed well design and construction specifications, including: (1) casing type — materials, diameter and thickness; (2) screen type — materials, diameter, thickness, interval, and length; and (3) centralizers — number, type, and locations.

e) The procedures for obtaining water-level measurements at each well.

f) A schedule for completion of the installation of wells and all related work.

4.2.2. The post-closure groundwater monitoring plan must contain a list of proposed indicator parameters capable of detecting leakage of hazardous waste or hazardous constituents into the groundwater. The list must include the basis for selecting each proposed indicator parameter, including any analysis or calculation performed. The basis for selection includes chemical analyses of the facility's waste and/or leachate as appropriate. The list must also include parameters to characterize the site specific chemistry of ground water at the site, including, but not limited to, the major anions and cations that make up the bulk of dissolved solids in water (i.e., Cl, Fe, Mn, Na, SO_4, Ca, Mg, K, NO_3, PO_4, silicate, and ammonium). The parameters must be representative of constituents that could reasonably be derived from the facility's waste, and must be chosen after considering:

a) The types, quantities, and concentrations of constituents in waste managed at the facility;

b) The mobility, stability, and persistence of waste constituents or their reaction products in the unsaturated zone beneath the waste management area;

c) The detectability of the indicator parameters, waste constituents or reaction products in ground water; and

d) The concentration or value and the natural variation (known or suspected) of the proposed monitoring parameter in background waste quality.

4.2.3. The post-closure ground water monitoring plan must include a time schedule for implementation of the system.

4.3. Within thirty (30) days after notification from the Department that the post-closure ground water monitoring plan is adequate, Respondent shall begin implementation of the plan according to the terms and schedules contained therein.

4.4. Within thirty (30) days after completion of installation of the post-closure ground water monitoring system, Respondent shall submit to the Department a report that provides the following information:

4.4.1. A description and map of actual well locations.

4.4.2. The surveyed elevation of each well's surface reference point and top of casing.

4.4.3. A description and schematic diagram(s) of the as-built well specifications including: (1) casing type — materials, diameter, interval, length, and slot size; (2) screen size — materials, diameter, thickness, interval, and length; (3) centralizers — number, type, and locations; and (4) filter pack — materials, location, interval, and method of emplacement.

4.4.4. A series of potentiometric surface maps, with an appropriate contour interval. These maps shall be based on a series of water level measurements obtained after the completion of all new wells. At a minimum, three series of water-level measurements shall be obtained from all existing wells and all new wells.

4.4.5. Copies of the original field geologic logs and edited geologic logs for all new borings.

4.6. Within sixty (60) days after the complete installation of the post-closure ground water monitoring system, Respondent shall submit a sampling and analysis plan capable of yielding representative samples for a comparison of upgradient and downgradient wells. The plan shall include the following elements:

4.6.1. Well evacuation procedures including volume to be evacuated prior to sampling and the corresponding handling procedures for purged well water.

4.6.2. Sample withdrawal techniques. Sampling equipment and materials (tubing, pumps, etc.) shall be selected to yield representative samples based on consideration of parameters to be monitored. The sampling protocol shall include field measurements of pH, conductivity, and temperature for each sample.

4.6.3. Sample handling and preservation techniques including provision for field-filtration of samples as appropriate.

4.6.4. Procedures for decontaminating sampling equipment between sampling hazardous waste site investigations. Prior to the initiation of site work, Respondent shall notify the Department in writing regarding the identity of ...

events.

4.6.5. Procedures for measuring ground water elevations at the time of each sampling event.

4.6.6. Chain-of-custody procedures to be used for all phases of sample management.

4.6.7. Laboratory analytical techniques, including EPA-approved analytical methods and quality assurance/quality control procedures.

4.6.8. Procedures for performing a comparison of upgradient and downgradient ground water to determine whether contamination has occurred. The procedures shall include a proposed method (statistical or otherwise) to compare upgradient and downgradient well water that provides a reasonable balance between the probability of falsely identifying and failing to identify contamination in accordance with 40 CFR, Sections 270.14 and 265 to determine if the background level has been exceeded in the downgradient wells.

4.7. Within thirty (30) days following notification by the Department that the sampling and analysis plan is adequate, Respondent shall begin implementation of said plan.

4.8. Within ninety (90) days following the beginning of implementation of the sampling and analysis plan, Respondent shall provide all results of the required analyses and tests to the Department for review.

4.9. Project Coordinator Within two days of the effective date of this Order, Respondent will designate and provide DHS with the name and address of a Project Coordinator whose responsibilities will be to receive all notices, comments, approvals and other communications from DHS to Respondent.

4.10. Project Engineer/Geologist All response work performed pursuant to this Order shall be under the direction and supervision of a qualified professional

Arthur Swajian, Executive Officer
California Regional Water Quality Control Board
Colorado River Basin Region
73-271 Highway 111, Suite 21
Palm Desert, CA 92206

Phil Bobel, Chief
Waste Programs Branch
US Environmental Protection Agency
T-2
215 Fremont Street
San Francisco, CA 94105

All approvals and decisions of DHS made regarding such submittals and notifications shall be communicated to Respondent by the Surveillance and Enforcement Unit Chief, Southern California Section, Toxic Substances Control Division, Department of Health Services or his designee. No informal advice, guidance, suggestions or comments by DHS regarding reports, plans, specifications, schedules or any other writing by Respondent shall be construed to relieve Respondent of its obligation to obtain such formal approvals as may be required herein.

4.15. DHS Review and Approval. If after review of any report, plan, schedule, remedial action plan or other document which Respondent submits for DHS approval pursuant to this Order, DHS determines that the document is not satisfactory and cannot be approved, DHS may take the following actions:

a. Make modifications to the submitted document as deemed necessary by DHS to protect public health and safety or the environment, and approve the document as modified; and/or

b. Return the submitted document to Respondent with recommended changes. Within a time period specified by DHS, Respondent shall submit a revised document incorporating the recommended changes to DHS for approval. All such approvals by DHS shall be in writing.

4.16. Modifications. The Department reserves the right to make such modifications as it may deem necessary to protect public health, welfare and/or the environment. Such modifications may be issued as amendments to this Order and shall be effective upon issuance.

4.17. Time Periods. Unless otherwise specified, time periods begin from the effective date of this Order and "days" means calendar days.

4.18. Extension Requests. If, for any reason, Respondent is unable to perform any activity or submit any document within the time required under this Order, Respondent shall request, in writing, an extension of the time specified. The extension request shall include a justification for the delay. All such requests shall be in advance of the date on which the activity or document is due.

4.19. Extension Approvals. If DHS is convinced that good cause exists for an extension as set forth in paragraph 4.18 it will grant the request and specify in writing a new schedule. Respondent shall comply with the new schedule.

4.20. Endangerment During Implementation. In the event that the Department determines that any activities (whether pursued in the implementation of or in noncompliance with this Order) or circumstances are creating an imminent or substantial endangerment to the health and welfare of people on the site or in the surrounding area or the environment, the Department may order Respondent to stop further implementation of this Order for such period of time as needed to abate the endangerment.

4.21. Site Access. Access to the site shall be provided at all reasonable times to employees, contractors and consultants of the DHS, and any agency having jurisdiction. Nothing in this paragraph is intended to limit in any way the right of entry or inspection that any such agency may otherwise have by operation of any law.

The Department and/or its authorized representative shall have the authority to enter and freely move about all property at the facility at all reasonable times for the purposes of, inter alia: inspecting records, operating logs, and contracts relating to the facility; reviewing the progress of Respondent in carrying out the terms of this Order; and conducting such tests as the Department may deem necessary. Respondent shall permit such persons to inspect and copy all records, documents, and other writings, including all sampling and monitoring data, in any way pertaining to work undertaken pursuant to this Order.

4.22. Noncompliance. In the event DHS believes that Respondent is not in compliance with this Order, or with any reports, plans, specifications, schedules or other documents incorporated as part of this Order pursuant to paragraph 4.12, DHS may provide Respondent notice in writing of such noncompliance. If Respondent does not remedy such noncompliance to the satisfaction of DHS within the time period specified by DHS in the notice, DHS shall immediately proceed to enforce the terms of this Order. DHS may also seek penalties for noncompliance as provided in paragraph 4.23 and cost recovery for state funds expended as provided in any such enforcement action. If Respondent remedies such noncompliance to the satisfaction of DHS and within the time period specified by DHS, Respondent shall not be deemed to be in noncompliance with this Order.

4.23. Penalties for Noncompliance. Failure to comply with the terms of this Order, or with any reports, plans, specifications, schedules or other documents incorporated as part of this Order pursuant to paragraph 4.12, may subject Respondent to civil penalties ~~and/or punitive damages~~ for any costs incurred by DHS or other government agencies as a result of such failure, as provided by the California Health and Safety Code section 25188 and other applicable provisions of law.

4.24. Additional Enforcement Actions. By issuance of this Order, DHS does not waive any further enforcement actions.

assigns and upon DHS and any successor agency with responsibility for administering the provisions of the Hazardous Waste Control Act.

4.31. Effective Date of This Order. This Stipulation and Order becomes effective on the date of issuance indicated below.

Dated: 3/8/88

Victor C. Furtado

Victor C. Furtado, Ph.D., Manager
Pacific Gas and Electric Company

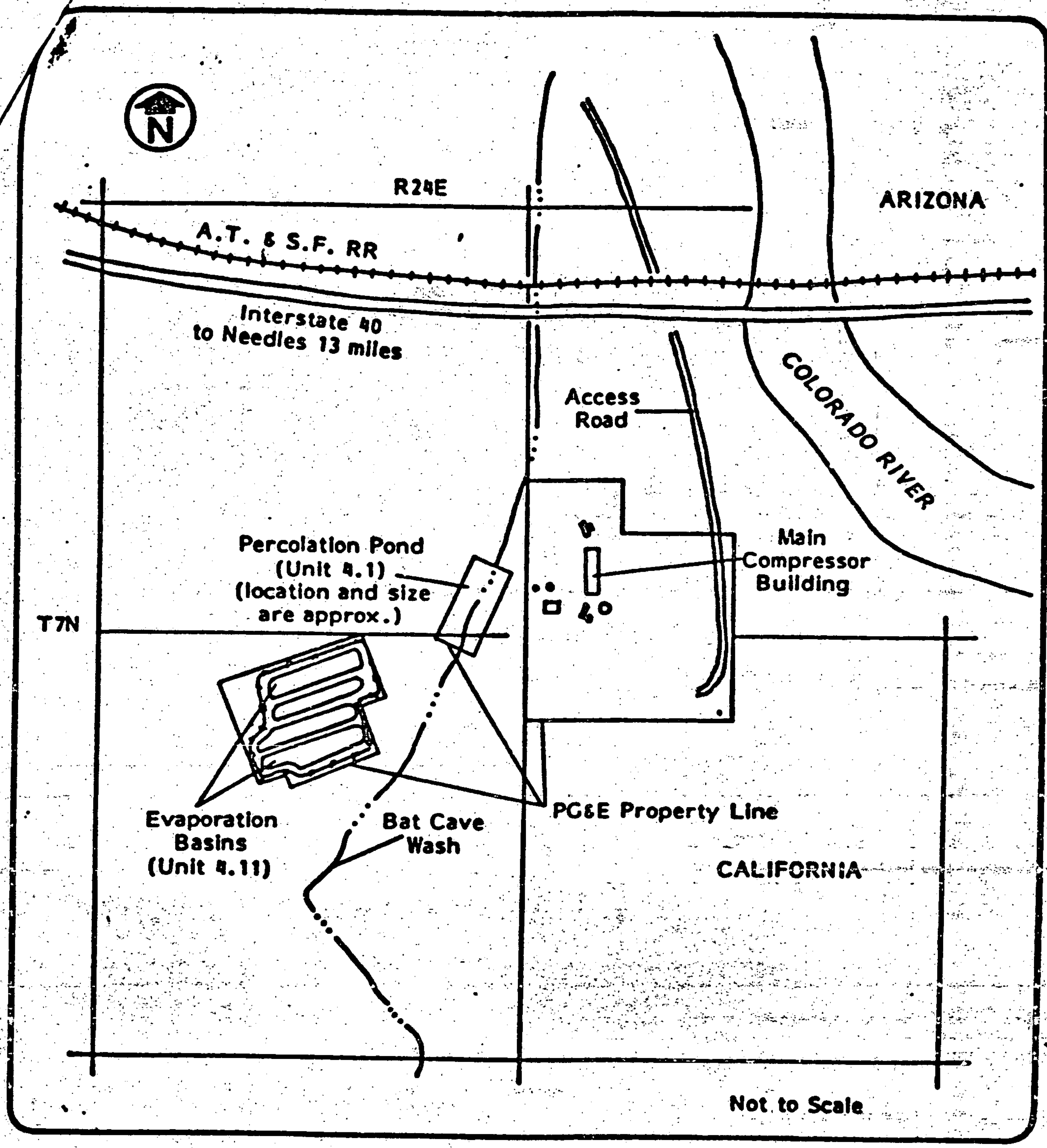
Dated of issuance:
3/9/88

Angelo Bellomo, Chief
Southern California Section
Toxic Substances Control Division
Department of Health Services

4.25. Compliance with Applicable Laws. Respondent shall carry out this Order in compliance with all local, State and Federal requirements, including, but not limited to, requirements to obtain permits and to assure worker safety.

4.26. Government Liabilities. The State of California shall not be liable for injuries or damages to persons or property resulting from acts or omissions by Respondent, its employees, agents or contractors in carrying out activities pursuant to this Order, nor shall the State of California be held as party to any contract entered into by Respondent or its agents in carrying out activities pursuant to this Order.

4.27. Liability. Nothing in this Order shall constitute or be construed as a satisfaction or release from liability for any conditions or claims arising as a result of past, current or future operations of Respondent. Notwithstanding



TOPOCK COMPRESSOR STATION

EXHIBIT 1

State of California | Department of Health Services

Memorandum

To : Mohinder Sandhu, Chief
Facility Permitting Unit
Region 4 (Long Beach)

Date : October 26, 1988

Subject: Project Reassignment

From : John A. Hinton, Chief
Facility Permitting Unit
Region 3 (Los Angeles)

The creation of the Long Beach Facility Permitting Unit has prompted the need for some current projects to be reassigned from Region 3 (Los Angeles) staff to Region 4 (Long Beach) staff. A project which needs to be reassigned is PG&E Topock. This land disposal closure project was previously handled by Charles Humphrey.

The closure plan was approved by DHS and EPA in July 1987. Because of the amount and type of attention this site requires at this time, I feel that it is an appropriate time to transfer project oversight to Region 4. The attached sheet describes the site progress to date and current status. Also Charles is available to assist Region 4 staff in getting "up-to-speed" on this project. If you have any questions, you may reach Mr. Humphrey at ATSS 640-6013.

Attachment

cc: Dennis Dickerson, DHS - LA
John J. Kearns, DHS - LB
Paula Rasmussen, DHS - LB
Jeff Scott, EPA Region IX
Arthur Swajian, CRB RWQCB
Ken Coulter, CRB RWQCB

RECEIVED
OCT 27 1988
TOXIC SUBSTANCES CONTROL DIVISION
REGION 4
LONG BEACH

SB

PACIFIC GAS & ELECTRIC COMPANY
TOPOCK COMPRESSOR STATION
CAT080011729

PROJECT SUMMARY

The Pacific Gas & Electric Company operates a Natural Gas Compressor Station located 15 miles southeast of Needles, California, off Interstate 40 in San Bernardino County. This facility is called the Topock Compressor Station (a.k.a. PG & E Topock) because of its proximity to Topock Arizona. The facility filed for Interim Status with EPA in November of 1980 and was issued Interim Status Document (ISD) number CAT080011729 in April, 1981 by DHS.

WASTE MANAGEMENT ACTIVITIES

Hazardous waste management activities conducted at the site were associated with the cooling tower wastewater treatment system. The wastewater from this system was considered hazardous because it contained approximately 10 ppm hexavalent chromium. The treatment process was designed to remove the hexavalent chromium through reduction and precipitation to form a chromic hydroxide sludge. The sludge was placed in concrete lined drying beds and later transported to a Class I disposal site. The effluent from the treatment process was discharged into surface impoundments for evaporation in the hot, arid climate at the facility.

In 1985 the facility switched its cooling tower water system from a chromium-based system to a phosphate-based system, thereby eliminating the generation of hazardous wastewater. However, PG & E relies upon continued operation of the cooling water system to conduct normal operation of its natural gas compressors. For this reason both EPA and DHS agreed to allow PG & E to discharge the non-hazardous wastewater into the existing surface impoundments until they could complete construction of new ponds for the phosphate-based wastewater. The non-hazardous wastewater ponds were expected to be operational around mid to late 1988, at which time the closure activities for the original ponds would commence.

FACILITY CLOSURE PLAN

The PG & E Hazardous Waste Facility Closure Plan was submitted for agency review in October, 1985, revised in August, 1986, and finally approved with DHS and EPA modifications in July, 1987. The Closure Plan addresses the decontamination and/or removal of all units associated with the hazardous wastewater generation including the surface impoundments, sludge drying beds, treatment tanks, piping, and other associated equipment. PG & E proposes to clean-close the facility.

As part of the closure oversight, DHS and EPA have agreed to review and approve or modify a sampling proposal submitted by PG & E for the surface impoundments. A meeting was held on October 20, 1987 with representatives of PG & E, DHS, and EPA present to discuss the merit of the proposal. To date the agencies have not yet made a final determination on the proposal. A final determination should be made well before PG & E is scheduled to begin sampling activities for the impoundments since they will need lead-time to mobilize drilling equipment and personnel.

STIPULATION AND ORDER

On March 16, 1988, a Stipulation and Order (Docket # HWCA 87/88-018, effective 03/09/88) was issued to PG & E by DHS enforcement for Interim Status Groundwater Monitoring System violations. The facility is required by the order to modify the existing system for Post-Closure purposes if the closure-verification sampling and analysis activities indicate that there has been a release of hazardous waste from the surface impoundments.

The timely approval of the sampling proposal is currently the most critical step for the project since it will have an impact on the facility's schedule, closure costs, and ability to determine if the Closure Performance Standard has been met.

Additionally, a current FMP should be developed to reflect closure oversight activities which include a CME to be scheduled in early 1989.

PROJECT CONTACTS

The following individuals were involved with the project at the time the Closure Plan was approved:

PG & E (San Francisco)	Cathy Rincon	(415) 972-6905
RWQCB (Colorado River Basin Region)	Mohammed Khan	(619) 346-7491
EPA (San Francisco)	Michael Fernandez	(415) 974-7475
DHS (FPU, Los Angeles)	Charles Humphrey	ATSS 640-6013
DHS (SEU, Long Beach)	Skip Ricarte Richard Brausch	ATSS 635-5950

A. Wittenden

United States Environmental Protection Agency
Washington, DC 20460

EPA OSWER Directive Initiation Request

1. Directive Number: 9476.00-14

2. Originator Information

Name of Contact Person	Mail Code	Office	Telephone Code
Chris Rhyne	WH-563	OSW/PSPD	(202) 382-4395

3. Title

Ground-Water Monitoring At Clean-Closing Surface Impoundement And Waste Pile Units

4. Summary of Directive (include brief statement of purpose)

This memo outlines the circumstances underwhich previously clean closed units will need to install ground-water monitoring and approaches used to effect installation. The memo also discusses circumstances under which ground-water monitoring may not be required.

5. Keywords

Closure / Ground-Water Monitoring

6a. Does This Directive Supersede Previous Directive(s)? [x] No [ ] Yes What directive (number, title)

b. Does It Supplement Previous Directive(s)? [x] No [ ] Yes What directive (number, title)

7. Draft Level

[x] A – Signed by AA/DAA [ ] B – Signed by Office Director [ ] C – For Review & Comment [ ] D – In Development

8. Document to be distributed to States by Headquarters? [x] Yes [ ] No

This Request Meets OSWER Directives System Format Standards.

9. Signature of Lead Office Directives Coordinator: Deborah L. Bennett — Date: 5-11-88

10. Name and Title of Approving Official: Peter Hubbard, OSWER Directive Coordinator — Date: 5/12/88

EPA Form 1315-17 (Rev. 5-87) Previous editions are obsolete.

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OSWER Policy Directive No. 9476.00-10

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 31 1988

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

MEMORANDUM

SUBJECT: Ground-Water Monitoring at Clean-Closing Surface Impoundment and Waste Pile Units

FROM: J. Winston Porter
Assistant Administrator

TO: Regional Administrators
Regions I-X

Several provisions of HSWA have made it necessary or desirable for a number of owners or operators to close their land disposal units. Many of these units are going through "clean closure"; that is, removal of all waste residues, contaminated containment system components, contaminated subsoils, and structures and equipment contaminated with waste and leachate. Several Regions have questioned whether a clean closure demonstration requires ground-water monitoring before the unit is declared clean for the purposes of closure under sections 264.228(a), 264.258(a), 265.228(a), or 265.258(a). The purpose of this memo is to reiterate and clarify Agency policy in this regard.

It has been the Agency's policy for some time that owners and operators must not be allowed to "walk away" from units with inadequate ground-water monitoring systems or with ground-water contamination at closure. This policy has been described in my August 27, 1985 memorandum regarding RCRA policies on ground-water quality at closure, in the FY 1987 and 1988 RCRA Implementation Plans (RIP), and in the clean closure policy outlined in the preamble to the final "conforming changes" rule concerning clean closure of surface impoundments, published in the Federal Register on March 19, 1987 (52 FR 8704). If an adequate ground-water monitoring system is in place, it is still the Agency's policy that as part of the clean closure certification process EPA must review ground-water monitoring data to verify that there is no ground-water contamination from the unit(s).

There exists, however, a universe of land disposal units that may not have a ground-water monitoring system, or may have an inadequate ground-water monitoring system in place at closure. These include interim status waste piles, interim status surface impoundments that contain corrosive-only hazardous waste that are eligible for a waiver under section 265.90(e), interim status units exempted from ground-water monitoring on the basis of the self-implemented waiver found in section 265.90(c), or units simply failing to comply with the Subpart F requirements.

Many of these units have already closed by removing waste and certifying "clean closure" without assuring clean ground water. Congress has made it clear that ground-water contamination at treatment, storage, and disposal units must be addressed. Section 3005(i) of RCRA requires all units receiving hazardous waste after July 26, 1982 to comply with ground-water monitoring standards established under Section 3004, regardless of their current active or inactive status. Any closed interim status unit covered under Section 3005(i) that does not meet the 40 CFR 264 clean-closure standard must be issued a post-closure permit implementing the appropriate Subpart F program. In order to avoid post-closure permit responsibilities, interim status facilities that have "clean closed" will need to present evidence that the "clean closure" is in compliance with the Agency's clean-closure rules found in sections 264.228 and 264.258. (This position is clearly presented in the Final Codification Rule, 52 FR 45788, December 1, 1987). Reexamination of all prior clean closures should be performed as suggested by the 1988 RIP and in concert with individual Regional priorities.

We recognize, however, that under certain circumstances for units that "clean-closed" under interim status a demonstration that ground water is uncontaminated might be made without a ground-water monitoring system in place. In order to preclude the need for ground-water monitoring at a clean closing unit the owner or operator would need to meet the decontamination standard as codified in section 270.1(c)(5) and (6) and make a demonstration in accordance with applicable waiver requirements found in section 264.90(b)(4). For clean-closing units at least the following criteria would need to be met to assure compliance with the general closure performance standard (section 264.111):

1) Accurate historical data on wastes handled at the unit have been carefully recorded, including a complete analysis of waste composition and characteristics;

2) The properties of the waste constituents together with the geochemical environment of the soils show no potential for migration to ground-water during the active life and any post-closure care period; and

3) Other supportive data (e.g., an alternative monitoring system or other geophysical verification) needed to ensure protection of human health and the environment.

We recognize that these criteria for not requiring ground-water monitoring are stringent. However, these restrictions are necessary because the Part 264 clean-closure demonstration may ultimately relieve the owner or operator of any further Subtitle C responsibilities at the closing unit or facility.

For those units authorized to operate under Section 3005(e) that stopped receiving waste prior to July 26, 1982, several tools exist for obtaining confirming data. Where the Administrator has determined, based on any information, that there has been a release of hazardous waste (or hazardous waste constituents) from a facility into the environment, Section 3008(h) may be used to perform studies (including ground-water monitoring) and/or corrective measures, as necessary to protect human health or the environment.

Where imminent and substantial endangerment can be established, studies and corrective measures can be required under Section 7003. Section 3013 could be used to collect data and to implement ground-water monitoring, where the presence or the release of hazardous waste "may present substantial hazard" to human health or the environment.

Where a permit for the facility is otherwise required, corrective action (including ground-water monitoring) for improperly "clean closed" units may be effected under Section 3004(u) during the permit process. In cases where an adequate ground-water monitoring system has not been installed and there is no valid ground-water monitoring waiver, and/or where other Subtitle C requirements have been violated, attempts at clean closure, whether successful or not, should not preclude the imposition of enforcement authorities, for example under Section 3008(a) to obtain remedies and/or penalties under Section 3008(g).

Should you have any questions regarding the content of this memorandum please contact Chris Rhyne of my staff at FTS 382-4695.

cc: Waste Management Division Directors, Regions I-X
RCRA Branch Chiefs, Regions I-X
Permit Section Chiefs, Regions I-X
Enforcement Section Chiefs, Regions I-X

Department of Health Services

Memorandum

To: SEU Region 4 / Permitting Region 4

Date:

Subject: Results of Review and Evaluation of Financial Assurance and Liability Documents

From: Diana Thomas
Financial Responsibility Unit
714/744 P Street
P.O. Box 942732
Sacramento, CA 94234-7320
Phone 8-454-2997

PG&E Topock (Facility) CAT080011729 (EPA ID#)

5 miles East of Needles off I-40, Needles, CA (Address)

As requested, the financial assurance and liability documents for the above-named facility have been reviewed and evaluated. The results of the evaluation are good for 60 days from the date of this memo and are as follows:

Financial Assurance for Closure/Post-Closure

Type of Document: Financial Test

Dollar amount Provided: $2,130,000 (Closure) $2,505,000 (Post-Closure)

Results of Evaluation: ✓ Pass ___ Fail (See Comments)

Liability Coverage

Type of Document: Financial Test

Dollar amounts: $1,000,000 (Per Occurrence) / 2,000,000 (Aggregate) SUDDEN

$ 3,000,000 (Per Occurrence) / 6,000,000 (Aggregate) NON-SUDDEN

Results of Evaluation: ✓ Pass ___ Fail (See Comments)

COMMENTS

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AUG 0 0 [illegible]

TOXIC SUBSTANCES CONTROL DIVISION
REGION 4
LONG BEACH

J Bertrum 7/31/89
FRU Unit Chief DATE

SB

STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF HEALTH SERVICES

714/744 P STREET
SACRAMENTO, CA 95814
(916) 324-2423

MAY 03 1989

Victor Furtado
PG & E Company
Post Office Box 7640
San Francisco, California 94120

CERTIFIED MAIL

Dear Mr. Furtado:

REPORT OF VIOLATION
EPA ID #CAT000011729

On March 14, 1989, the Department of Health Services completed a review of the financial responsibility file for the above-named facility located 15 miles east of Needles, off I-40 in Needles, California.

As a result of this review, we have determined that the facility is in violation of Title 22, California Code of Regulations, section 67015 by failing to provide evidence of financial assurances for post-closure care costs.

Please submit the following immediately:

> Financial documents for post-closure costs in the form of a trust fund, surety bond, letter of credit, post closure insurance, a financial test/corporate guarantee, or alternative mechanism. The required wording and forms are enclosed.

The issuance of this Report of Violation does not preclude the Department from taking administrative, civil, or criminal action related to the violations noted herein.

If you have any questions regarding this Report of Violation, please contact Diana Thomas at (916) 324-2997.

Sincerely,

Rubia Bertram

Rubia Bertram, Chief
Financial Responsibility Unit
Toxic Substances Control Division

RECEIVED
MAY 16 1989
TOXIC SUBSTANCES CONTROL DIVISION
REGION 4
LONG BEACH

Enclosures

cc: (see next page)

S/B

cc: Permit Unit
Region 4

Surveillance and Enforcement
Region 4

Arnold Robbins
EPA - Region IX

FY 85 COMPLIANCE MONITORING AND ENFORCEMENT LOG

INSPECTOR: JOSEPH DESAI
DAVID SCHWARTZBART

EPA ID: CAT080011729

3. RCRA FACILITY: [X]

4. FACILITY:
/X/Major TSD
/ /Non-Major TSD
/X/Generator
/ /Trans
/ /Other

HANDLER NAME: P G and E TOPOCK COMPRESSOR STATION
P.O. BOX 337, NEEDLES, CA 92363

5. DATE OF INITIAL EVALUATION WHICH IS THE BASIS FOR THIS REPORT: 10/14/87

5a. RESPONSIBLE AGENCY: S = State (DHS / SWRCB)
B = Contractor/State (County)

6. TYPE OF EVALUATION COVERED BY THIS REPORT:
(circle all that apply)

1 = Evaluation Inspection (annual/ISD)
2 = Sampling inspection
3 = Record Review
4 = Ground Water Monitoring Evaluation
5 = Follow Up

(Others)
6 = Citizen Complaint
7 = Part B Call In
8 = Withdrawal Candidate
9 = Closed Facility
0 = General
A = Meetings

7. DATE OF EVALUATION COVERED BY THIS REPORT (enter only if different from 5): __/__/__

8. VIOLATIONS:

Class of violation	Area of Violation						
	GWM	CL/PC	Fin.Res	Pt. B	Cmpl.Sch	Manifest	Other
I	4-S					1-0 3-0	1-0 3-0
II						1-0 3-0	1-0 3-0

Comments
NOTE:- 4-S DENOTES ON GOING VIOLATIONS.

9. ENFORCEMENT ACTIONS:

Class	Area of Violation	Type (use code)	Date Action Taken	Compliance Dates		Penalty		Agcy (code)
				Scheduled	Actual	Assessed	Collected	

Comments:

3/13

DEPARTMENT OF HEALTH SERVICES
107 SOUTH BROADWAY, ROOM B 48
LOS ANGELES, CA 90012

INSPECTION REPORT
P G and E Topock Compressor Station
P.O. Box 337
Needles, CA 92363
RCRA, Major
CAT080011729

Inspected by: Joseph Desai and David Schwartzbart
Date of Inspection: 10/14/87
Date of Report: 10/29/87

I. Purpose:

Annual Compliance Evaluation Inspection.

II. Representatives Present:

A. State Inspectors: Joseph Desai, WME, CADOHS
David Schwartzbart, HMS, CADOHS

B. Facility Representatives: Rex Avila, Operations Supervisor
James Soden, District Foreman
John Chesworth
Todd Hogenson

III. Facility Description and Background:

The Topock Gas Compressor Station is located in the eastern part of San Bernardino County, about 14 miles southeast of Needles at the north end of the Chemehuevi Mountains. This station provides compression to natural gas being pumped from out-of-state sources to PG and E markets in Northern California and handles one third of PG and E's total natural gas supply. The station has ten Cooper Bessemer make compressors with a total combined output of 35,000 horsepower. Each compressor is driven by a gas powered Internal Combustion Engine. The gas is conveyed to the station through two 34" diameter pipe lines. The gas from these pipes is made to pass through a battery of twelve scrubbers where traces of oil and particulate matter are separated from the gas. The gas is then fed into the compressors where its pressure is raised from 620 psig. at the intake to about 860 psig. (max.) at the discharge. The temperature of the gas rises to about 150 F. and it is passed through two heat exchangers enclosed in the two cooling towers. The heat from the hot compressed gas is extracted by spraying water on the heat exchangers and the temperature of the gas drops to about 80-110 F. The compressed gas is transmitted onwards through two 34" diameter pipe lines.

Process and cooling water for all plant operations is obtained from three water wells located in Topock, Arizona. The water is pumped through a 6" line to two 250,000 gallon storage tanks located on the hill south of the compressor station.

The compressor station has its own 1200 KW power plant equipped with four Ingersoll Rand Generators of 300 KW each. Each of these generators is driven by a gas powered Internal Combustion Engine. The high pressure lubrication oil for the compressors and the generators is water cooled in separate heat exchangers and the hot water generated in this cooling process is cooled by passage through another set of heat exchangers housed in the cooling towers. The use of chromium based corrosion inhibitors and biocides in the cooling tower water was discontinued in October of 1985 and since then the facility has used phosphate based compounds for this purpose. These compounds are supposed to be non-toxic.

There have been violations in the past in the areas of closure and manifest which were subsequently resolved. The first ground water violation was determined on 03/14/85 and the case was referred to the Attorney General on 12/18/85. After subsequent review DOHS decided to address this issue by an Administrative Order which is currently being negotiated as a Consent Order with the facility. This action will address all outstanding violations in the Ground Water Monitoring area.

IV. Waste Streams and Waste Management Procedures:

A. Cooling Tower Water. The cooling tower water is tested daily and bled partially and replenished with fresh water to maintain its quality within prescribed limits. The bled water or the blowdown(wastewater) is pumped into a holding tank. Compressor and Generator Engine drains are also connected to this holding tank and according to the facility representative Mr. Rex Avila small amounts of oil get mixed with the periodical cooling water drainage from the engines. A small electric powered oil-skimmer is mounted on this tank to remove this oil from the wastewater. The skimmer is operated at intervals as necessary to skim small quantities of oil floating on the water surface in the holding tank. The skimmed oil is transferred to a small portable tank and then it is emptied into the sump. The water from the holding tank flows into another tank adjacent to it and is then pumped to any of the four evaporation ponds located about 1500 feet away southwest of the facility.

B. Waste Oil. The lubrication oil in the compressors and the generators is discarded at an interval ranging from ~~60,000 to 70,000 hours~~ of operating time. This used oil drains into the sump, and then it is stored in a 7,000 gallon overhead tank. The total quantity of used oil generated at the facility varies from 16,000 to 20,000 gallons/year depending upon the mode of operation. This waste oil is recycled through IT corp. or California Oil Recyclers Inc.

C. Waste Mercury. Waste mercury is generated from periodical maintenance work carried out on various instruments such as manometers, pressure guages, temperature controllers and vibration switches which are used at the facility. A total of about 20 lb./year is generated and it is recycled through Quick Silver Inc.

D. Miscellaneous Waste. The other wastes generated at the facility include a proprietory solvent called Kleenapart which is supplied by SELIG and used in their parts washer to clean parts, empty aerosol and paint cans, oily rags, discarded auto batteries and used oil filters. The waste solvent is recycled and the other items are disposed of as hazardous waste through ~~American Environmental Services Inc.~~

V. Observations:

1. Record Review. Records of training and waste management indicated that the facility was generally in compliance with the regulations.

2. Facility Walkthrough. A walkthrough of the facility indicated good house keeping, proper handling, storage and labeling of hazardous waste.

3. Ground Water Monitoring Evaluation.

In the weeks before the inspection date, documents relevant to the ground water monitoring system were thoroughly reviewed in the office. These documents are listed at the end of this section. This was followed on 10-14-87 by a walk-through inspection of the facility, inspection of documents (2,5,and 8 below) at the facility and a discussion with facility personnel. Documents 8 below were copied and retained during the facility document inspection. Documents referenced in the text utilize the numbers assigned them in the listing below.

The document review conducted in the office before the inspection revealed a number of deficiencies and problems in PG & E, Topock's ground water monitoring system.

Site characterization of the PGE, Topock site is inadequate as described in documents 1,3 and 4. Pages 1,10 and 11 of document 1 describe deficiencies in the location &/or assessment of the upper aquifer, potential vertical gradient(s) present in the aquifer(s), potential hydraulic interconnection among aquifers, and hydraulic conductivities of the aquifer(s). Pages 4 and 5 of document 3 detail deficiencies in the following areas of site characterization study: determinations of vertical gradients, hydraulic conductivity, permeability, storage coefficient and upper aquifer. Pages 2 and 3 of document 4 detail deficiencies in the following determinations and representations neccessary to site characterization: bedrock map, cross-section, number of boreholes, water level map , upper aquifer, hydraulic parameters and interconnections and flow rate and flow direction.

Well construction and placement problems exist at PG & E, Topock as described in documents 1 and 4. Pages 11 and 12 of document 1 detail problems with well screens, well spacing and number of wells. Pages 4 and 5 of document 4 detail problems with the number and placement of wells, screen length and placement and screen and filter pack size determination criteria. All these deficiencies are still outstanding except for the following which are addressed in document 6. Page 5 of document 6 states that sieve analysis has indicated that screen and filter pack sizes are appropriate in all wells. Page 6 of this document briefly addresses screen length problems but the corrections offered do not appear to be adequate for the complete system.

Document 1, pages 12 and 13 describe past problems with the Sample Analysis Plan, 4th replicate samples and sample parameter omissions. These problems appear to have been corrected, shown in documents 5 and 8.

MWP-8 sample results have shown and continue to show high concentrations of some parameters. These are discussed in document 1, page 13, document 2, pages 2, 21 and 22, document 4, page 5 and document 5, page 4-1 and 4-2. Document 8, 3-87 results, pages 1, 3 and 4, and document 8, 6-87 results, page 1 show high concentrations in MWP-8 samples collected recently. These document 8 results have been included as attachments.

In addressing the MWP-8 sample results page 4-1 of document 5 suggests that inappropriate analysis methods are being applied to MWP-8 samples. The question of alternatives and solutions was not addressed and must therefore be addressed if this is shown to be the case. Page 4-2 of document 5 describes differences in chemistry between pond 2 samples and MWP-8 samples. Similarities also exist as shown in Table C-1 from document 5, which is also attached. Pages 2 and 3 of document 6 also address the high concentrations in MWP-8 samples. Some explanation is presented and work to support this explanation is proposed.

Documents 8 were tables of raw data with no analyses or explanations included. Page 1 of the 3-87 results showed an elevated level of Fe in MWP-9 and page 1 of the 6-87 results showed an elevated level of Mn in MWP-9. These pages are attached.

The facility walk-through inspection included a visual inspection of wells P-1, MWP-7, MWP-1, MWP-8, MWP-2, Mwp-10, Mwp-9, MWP-3 and P-2 (renamed MWP-12). All wells were labeled and had locked outer caps but wells P-1 and MWP-1 did not have inner caps on the inner cases.

After reviewing the ground water monitoring system documents presented at the facility (documents 2,5 and 8 below), and copying document 8, matters were discussed with facility representatives. At this meeting and in subsequent telephone conversations facility representatives stated the following:
-No site characterization work has been done since 2-86
-No well construction or modification work has been done since 2-86
-The only work done relative to the ground water monitoring system since 2-86 was the renaming of P-2 to MWP-12 & well sampling
-The first year sampling, in which background values are established, was compressed into the period 12-85 to 6-86 to expedite matters (with DHS approval)
-The first subsequent sampling was conducted in 8-86
-PG & E has no explanation for the high concentrations in MWP-8 that is not included in the referenced documents and
-PG & E had no awareness of the high concentrations in well MWP-9 & had no explanation for this.

1. GCA Corp. Tech. Div. Inc. 'Technical Review of Documents PG & E Topock Compressor Station' letter report dated Feb. 1986 (on EPA contract)

2. PG & E Dept. of Eng. Research 'Construction, Development & Sampling of Topock Compressor Station RCRA Ground Water Monitoring Wells' dated 8-1-86

3. CRWQCB, Colorado River Basin Region 'RCRA Evaluation Report' dated 10-17-86

4.CRWQCBCRB 'Staff Comments on PG & E Topock's Revised Closure Plan & Revised Ground Water Monitoring Report' dated 1-29-87

5.Brown & Caldwell 'Water Quality Evaluation RCRA Ground Water Monitoring System, PG & E Topock' dated Jan. 1987 (on PG & E contract)

6. Letter from Victor Furtado Ph.D., PG & E, to Angello Bellomo, DHS, titled 'Topock Compressor Station Groundwater Monitoring Program', dated 1-30-87 and receieved by DHS 8-25-87.

7. A. T. Kearney Inc 'RCRA Facility Assessment PG & E Topock Compressor Station, Needles, CA dated August 1987 (on EPA contract)

8.Three Brown & Caldwell 'Reports of Analytical Results' dated Dec. 86, March 87, & June 87 (on PG & E contract)

VI. Potential Violations:

40 CFR Section 265.90 (a) and (b): PG & E Topock's ground water monitoring system is not capable of determining the facility's impact on the quality of ground water in the uppermost aquifer underlying the facility. This is primarily due to site characterization, well placement and well construction inadequacies and deficiencies.

40 CFR Section 265.91 (a): PG & E Topock's ground water monitoring system is incapable of yielding ground water samples that adequately represent background and down gradient water quality. This is primarily due to site characterization, well placement and well construction inadequacies and deficiencies.

40 CFR Section 265.91 (c): PG & E Topock's ground water monitoring wells have been improperly and inadequately screened.

The source of the high concentrations of some parameters repeatedly seen in MWP-8 samples has not been identified. Documents 5 and 6 theorize that these concentrations may not be due to ground water contamination by PG & E Topock but failed to supply adequate supporting evidence. Physical efforts to specifically and definitely identify the source have not been documented.

VII. Discussion With Management:

During the inspection of the evaporation pond area a white precipitate and soil moisture were noticed on the East end of pond # 4. When the facility representative Mr. James Soden was questioned about this his response was that there was no leaky pipe or valve or overflowing of the pond and he said that the wet patches were due to the rain they had over the past couple of days. When he was specifically asked about the white precipitate he said it was due to the natural lime content of the soil in the area.

Discussion with facility representatives concerning the ground water monitoring system is described on page 4, paragraph 3 as part of the 'Ground Water Monitoring Evaluation' section of this report.

VIII. Attachments:

1. Gas Line Map.

2. Location Map.

3. Plot Plan and Site Map.

4. Evaporation Pond Area Map.

5. Compressor Station Layout Map.

6. Copies of photographs of waste management units taken during the facility inspection on October 14, 1987.

7. Sample Analysis Results from Ground Water Monitoring Evaluation Document 5; Appendix C, Table C-1 and Document 7; March, 1987 and June, 1987 Results.

8. EPA TSD and Generator Checklists.

ATTACHMENT 1.

STANDARD PACIFIC GAS LINES INC.

Pipelines

181 Miles 12"-36"

UNDERGROUND STORAGE

(Storage Capacity)

McDonald Island

77 Billion Cubic Feet
@ 2070 psig

Los Medanos

15 Billion Cubic Feet
@ 1600 psig

Pleasant Creek

2 Billion Cubic Feet
@ 1250 psig

Coalinga Nose

Operated by UNOCAL
Only used for withdrawal
(Maximum Capability
150 Million Cubic Feet/Day)

LINE 300 TRANSMISSION SYSTEM

Pipelines

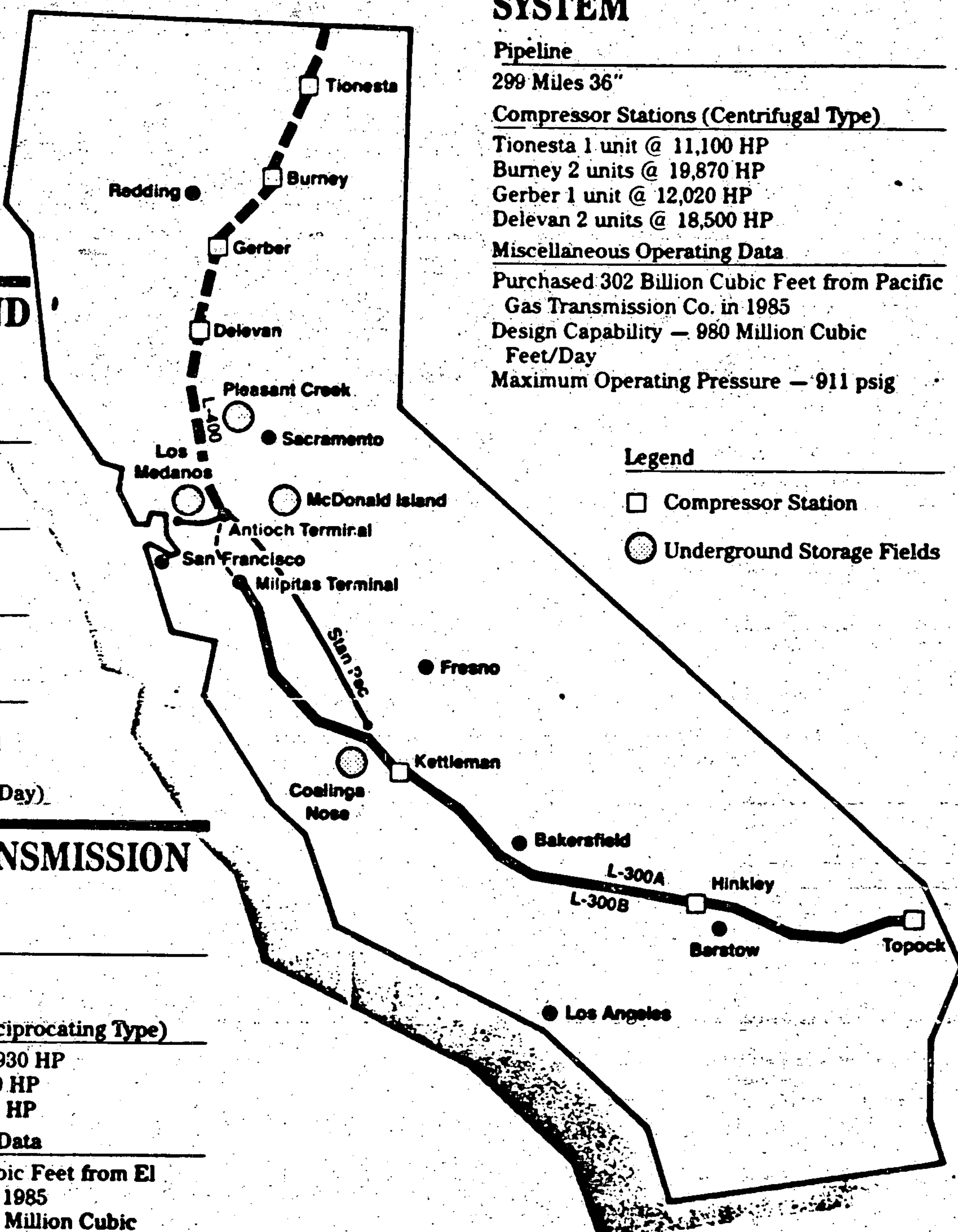
Line 300-A 502 Miles 34"
Line 300-B 502 Miles 34"

Compressor Stations (Reciprocating Type)

Kettleman 13 units @ 28,930 HP
Hinkley 12 units @ 39,600 HP
Topock 10 units @ 35,000 HP

Miscellaneous Operating Data

Purchased 305 Billion Cubic Feet from El Paso Natural Gas Co. in 1985
Design Capability — 1140 Million Cubic Feet/Day
Maximum Operating Pressure — 867 psig



LINE 400 TRANSMISSION SYSTEM

Pipeline

299 Miles 36"

Compressor Stations (Centrifugal Type)

Tionesta 1 unit @ 11,100 HP
Burney 2 units @ 19,870 HP
Gerber 1 unit @ 12,020 HP
Delevan 2 units @ 18,500 HP

Miscellaneous Operating Data

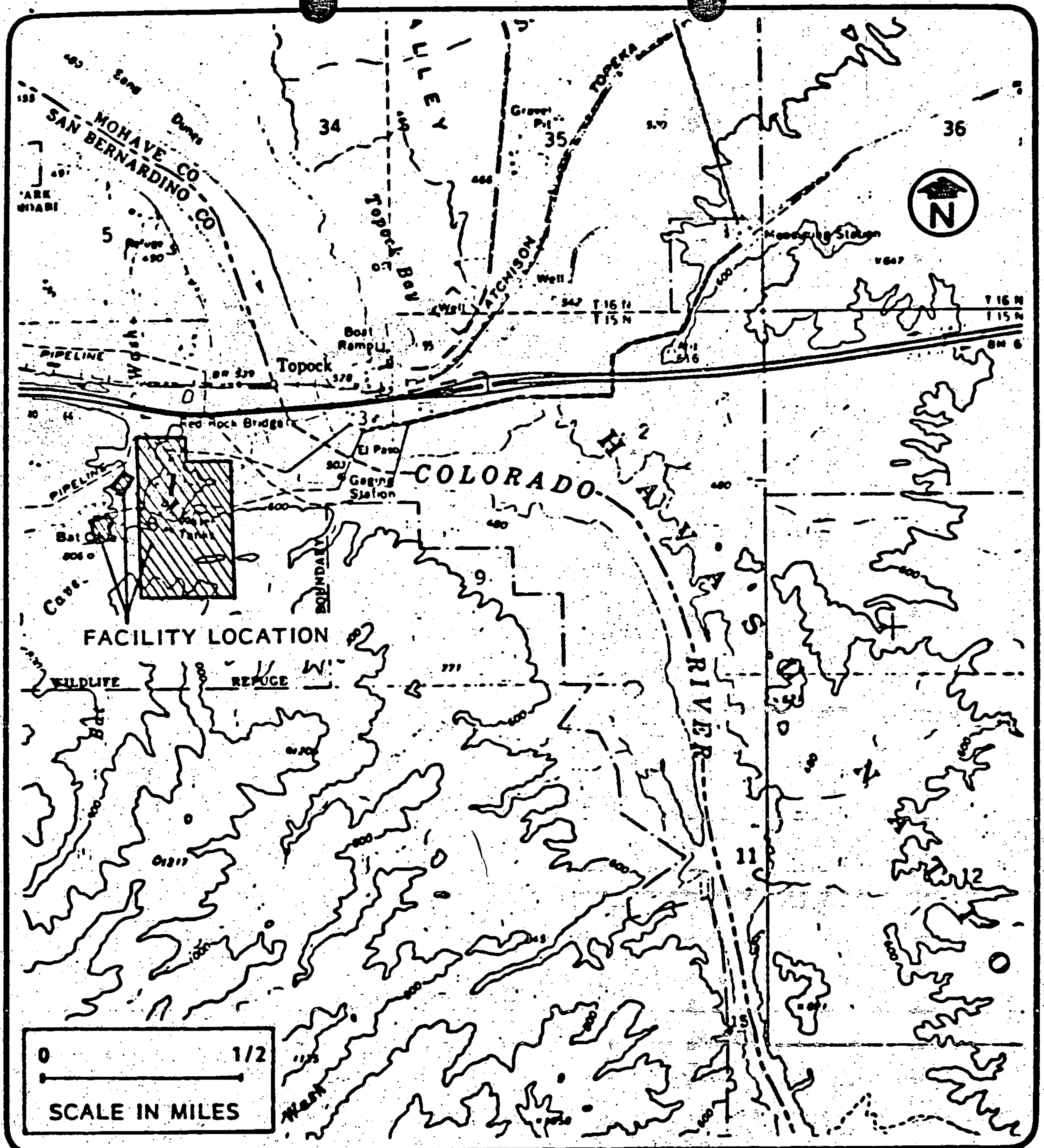
Purchased 302 Billion Cubic Feet from Pacific Gas Transmission Co. in 1985
Design Capability — 980 Million Cubic Feet/Day
Maximum Operating Pressure — 911 psig

Legend

□ Compressor Station

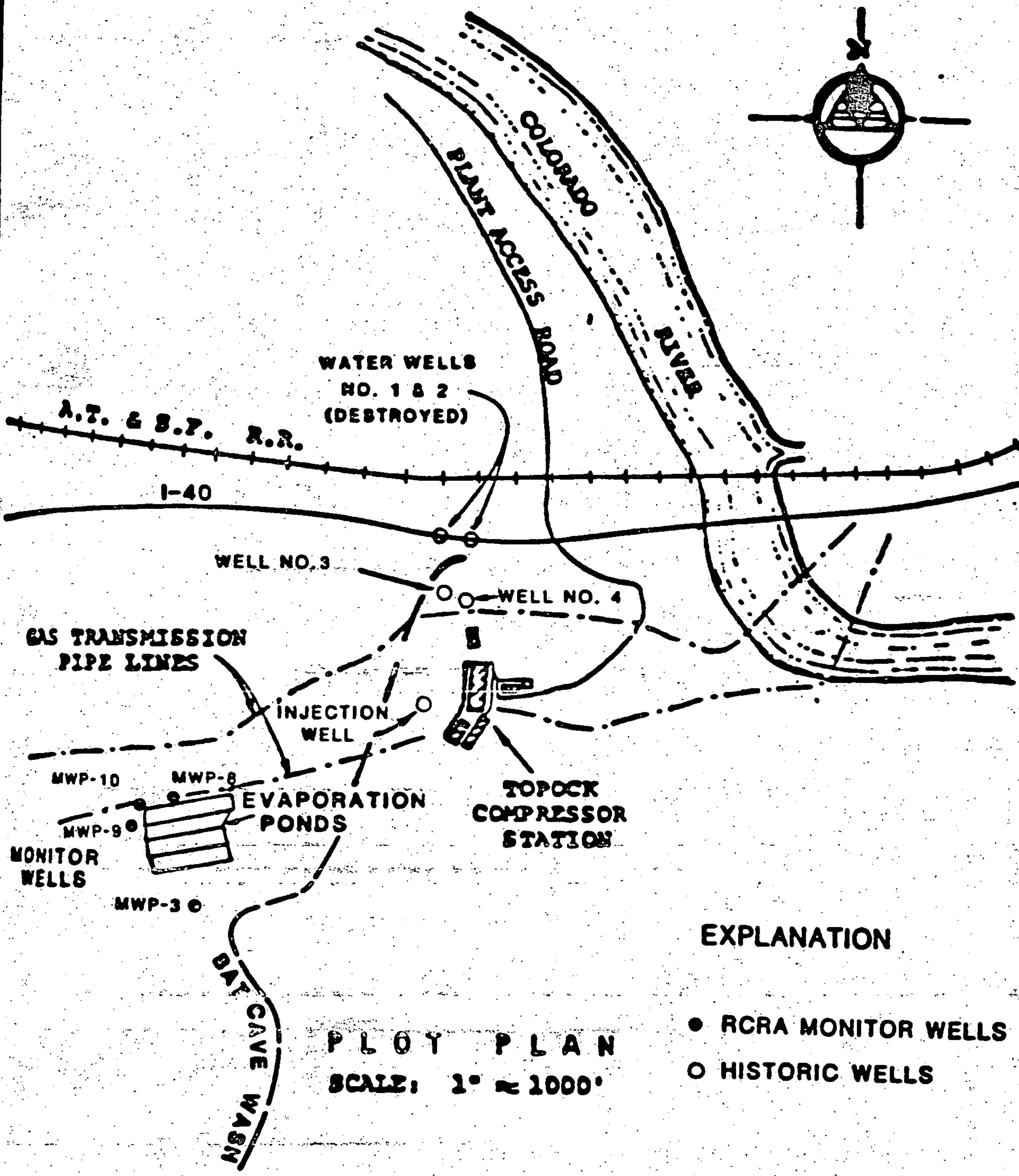
Underground Storage Fields

ATTACHMENT 2.

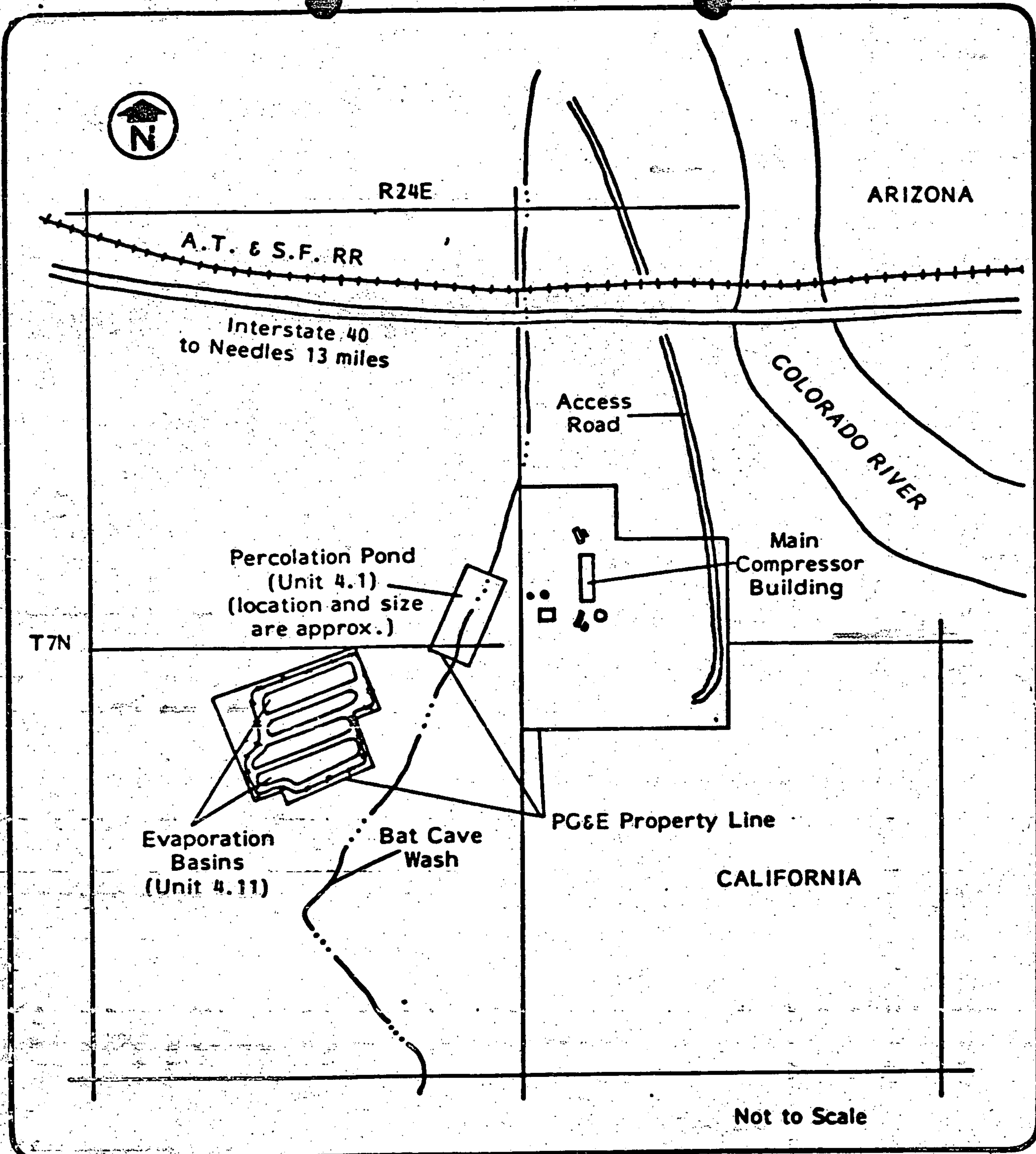


REGIONAL LOCATION OF THE TOPOCK COMPRESSOR STATION
Source: USGS 7.5' Quad
Topock AZ-CA, 1970.

ATTACHMENT 3.



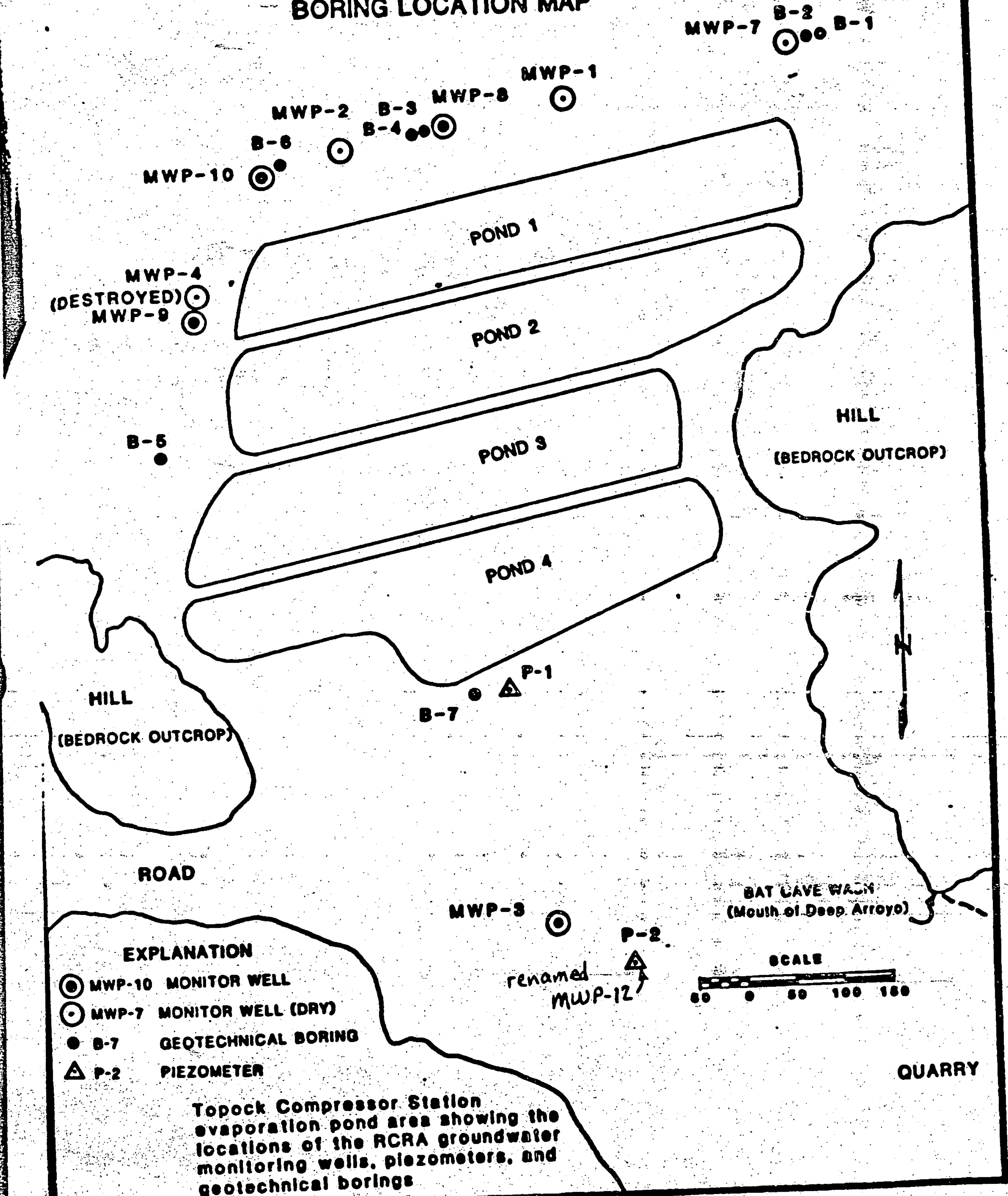
Topock Compressor Station, evaporation pond waste management area showing the location of the RCRA groundwater monitor wells and historic wells.



TOPOCK COMPRESSOR STATION

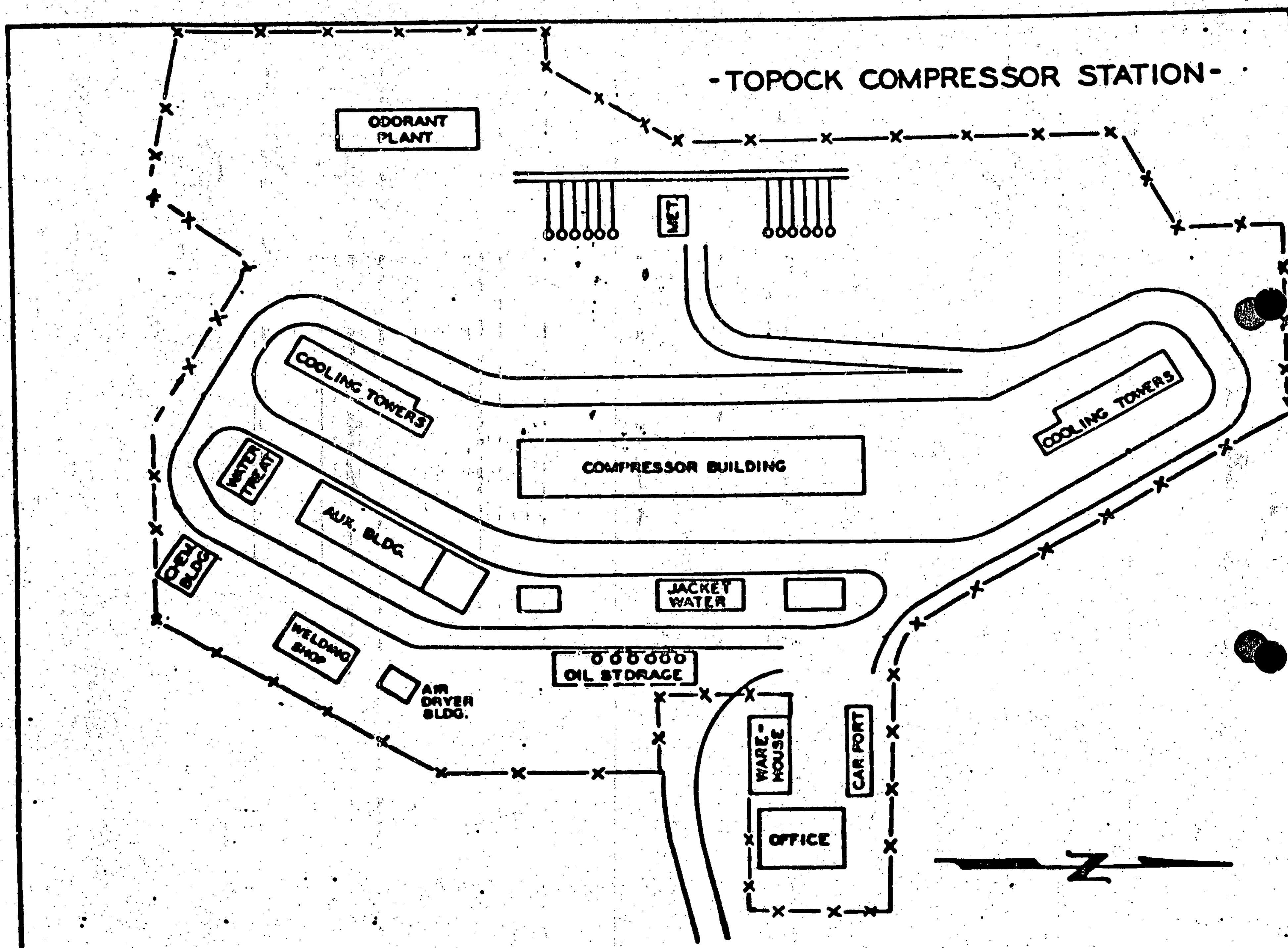
ATTACHMENT 4.

TOPOCK COMPRESSOR STATION EVAPORATION POND AREA BORING LOCATION MAP



Topock Compressor Station evaporation pond area showing the locations of the RCRA groundwater monitoring wells, piezometers, and geotechnical borings

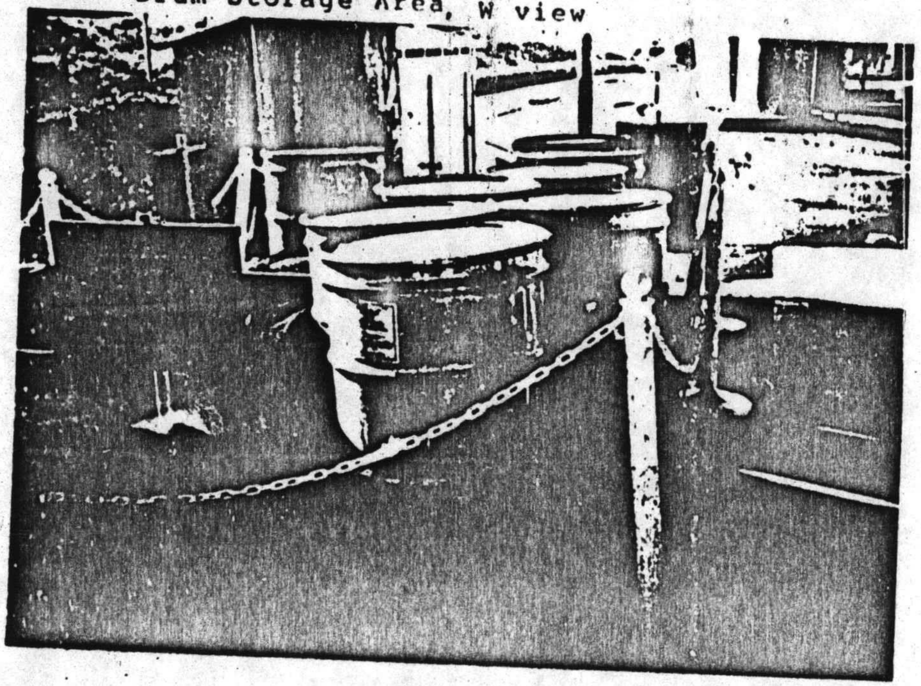
ATTACHMENT 5.



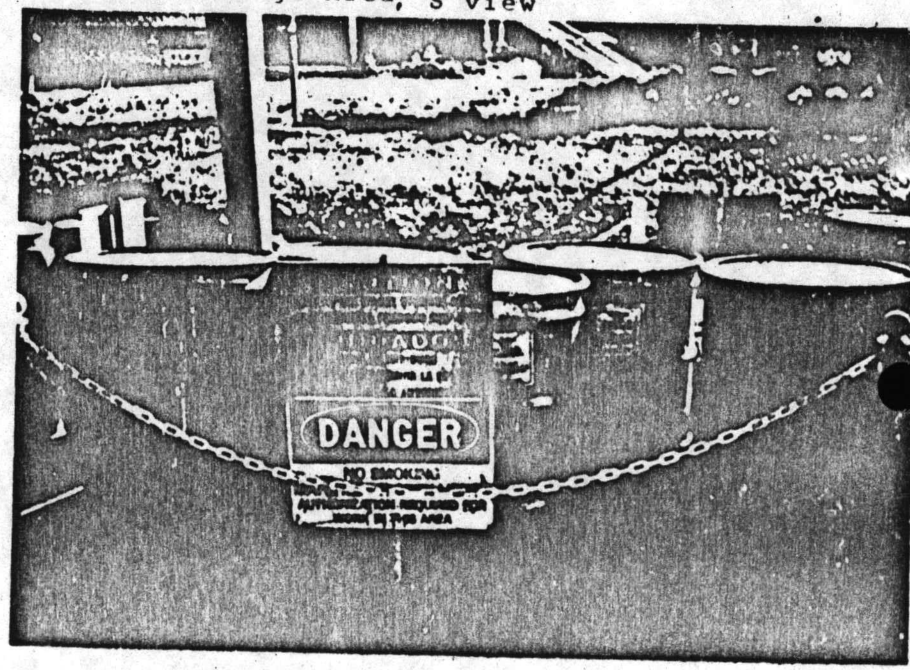
-TOPOCK COMPRESSOR STATION-
ODORANT PLANT
MET.
COOLING TOWERS
COOLING TOWERS
WATER TREAT.
COMPRESSOR BUILDING
AUX. BLDG.
CHEM. BLDG.
JACKET WATER
WELDING SHOP
AIR DRYER BLDG.
OIL STORAGE
WARE-HOUSE
CAR PORT
OFFICE
N

ATTACHMENT 6.

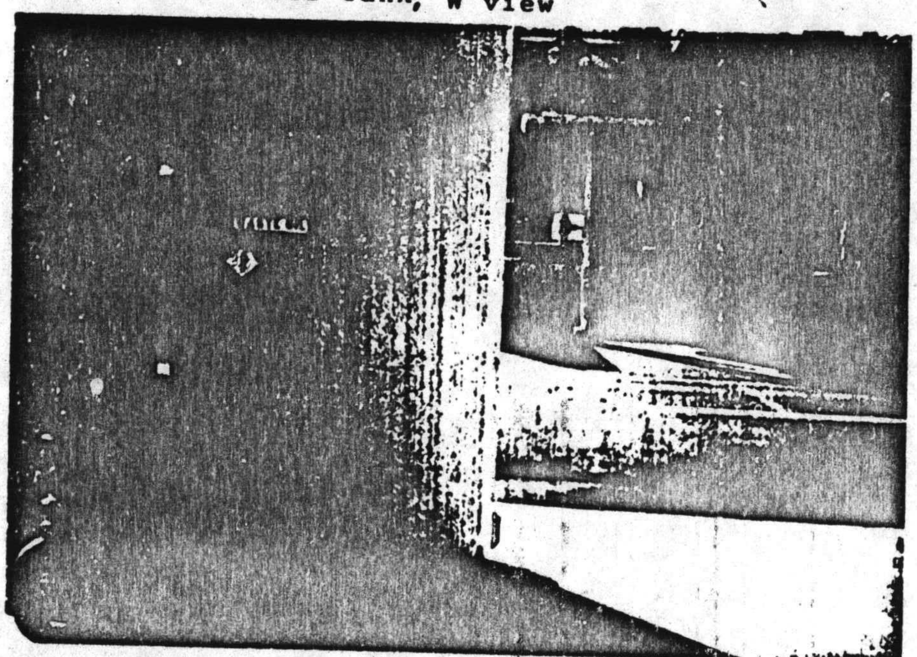
Drum Storage Area, W view



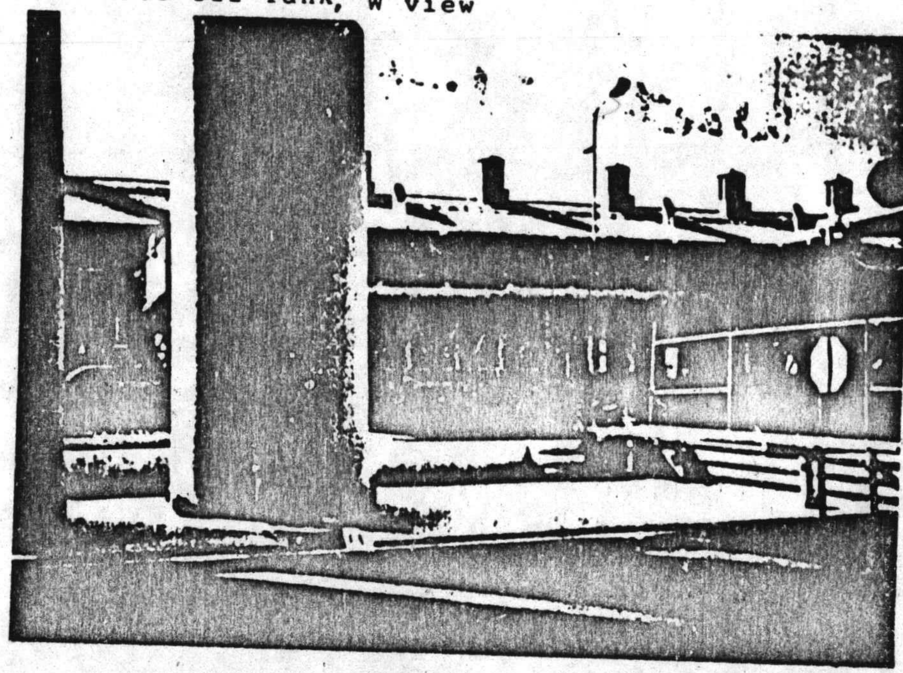
Drum Storage Area, S view



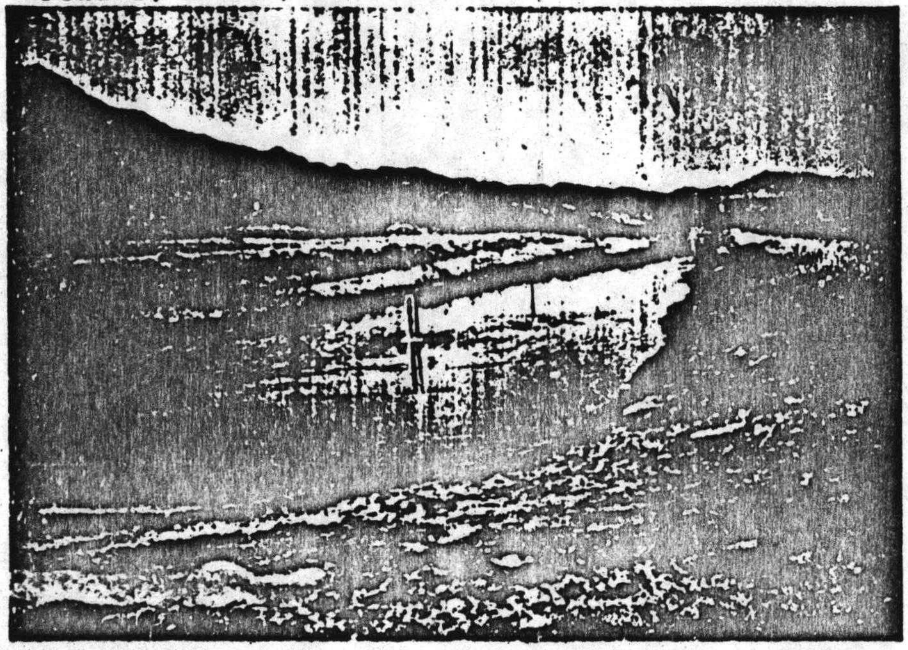
Waste Oil Tank, W view



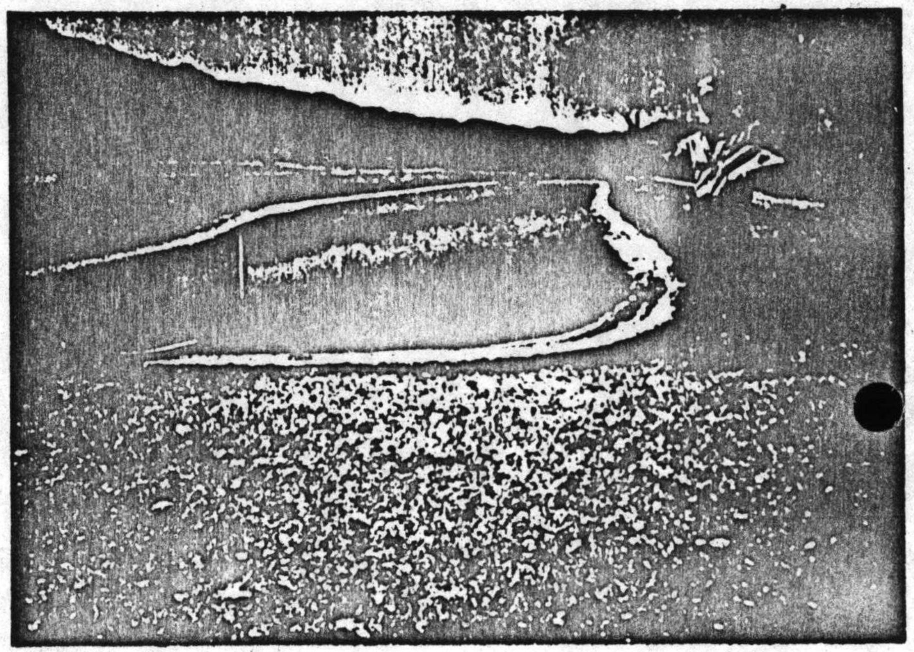
Waste Oil Tank, W view



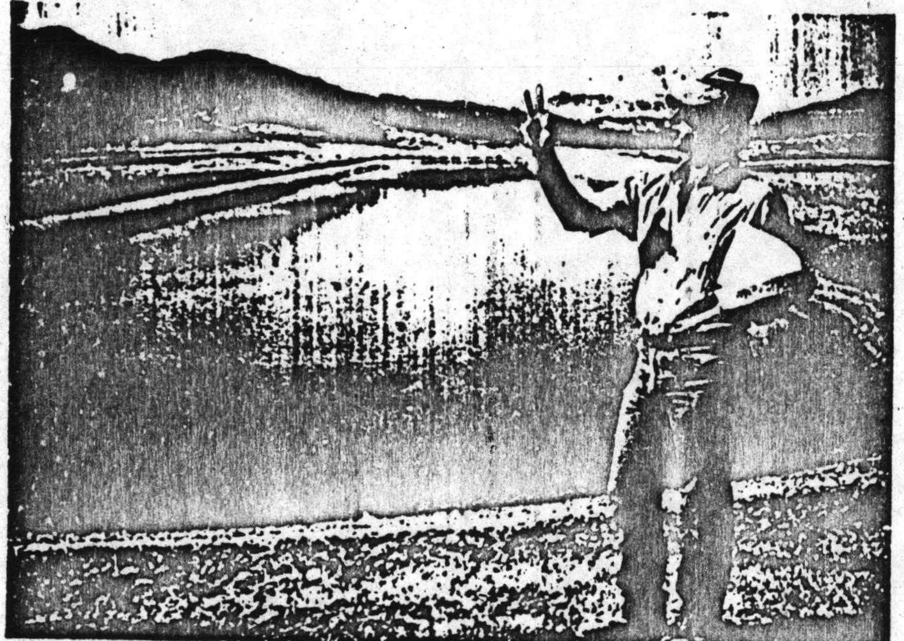
Pond 1, E end, W view



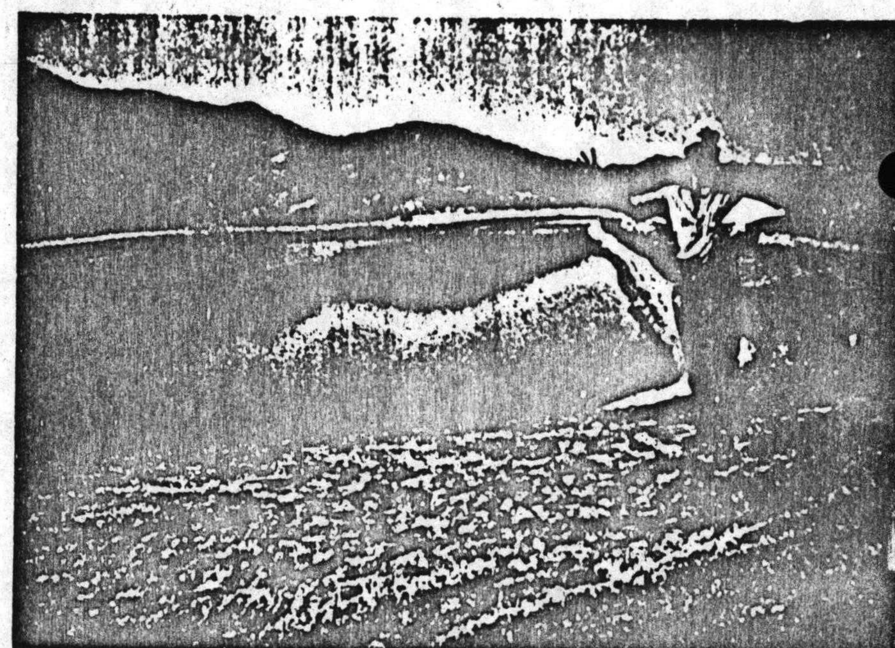
Pond 2, E end, W view



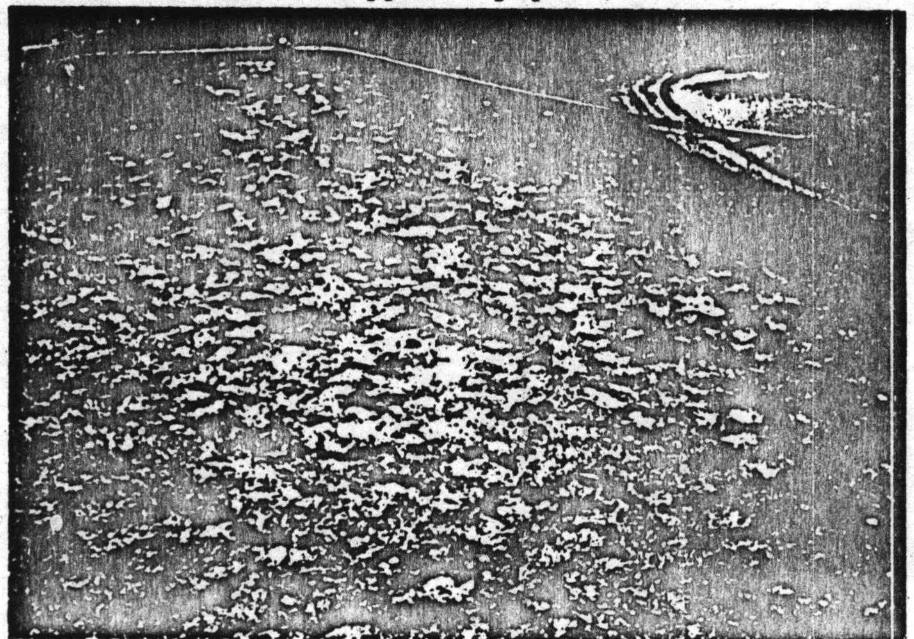
Pond 3, E end, W view



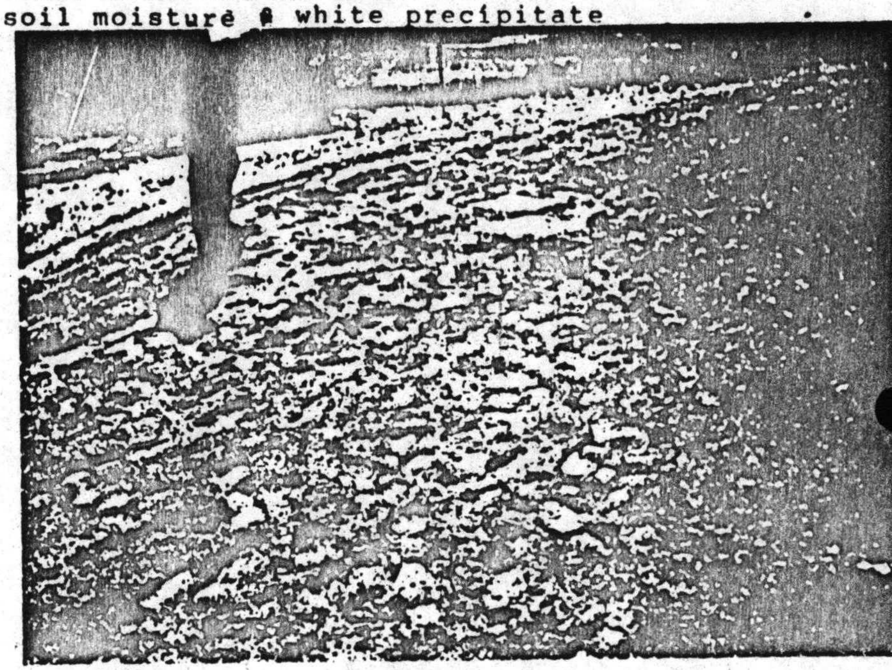
Pond 4, E end, W view



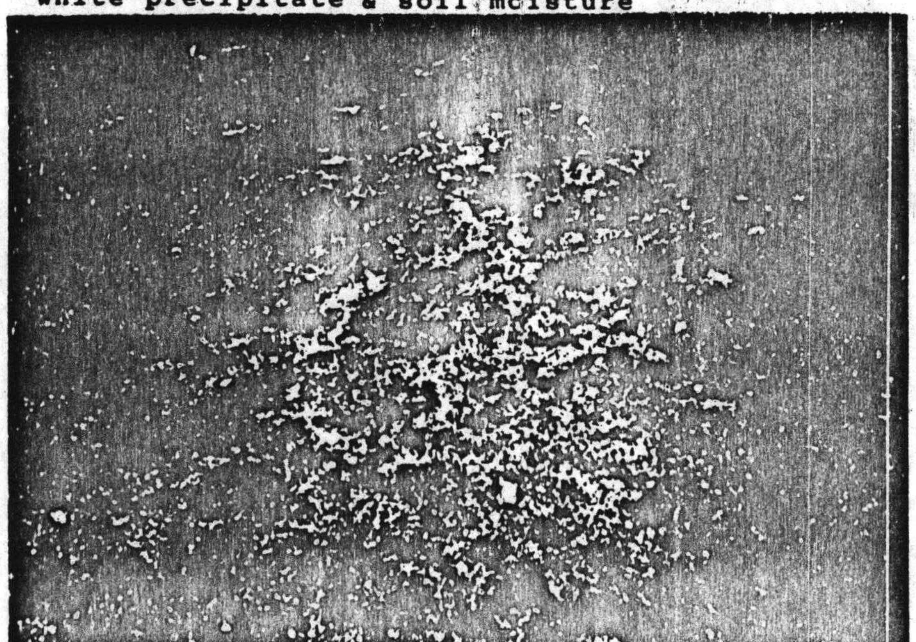
Pond 4, E end, S view,
soil moist. & wh. ppt. & pipe w/ valve



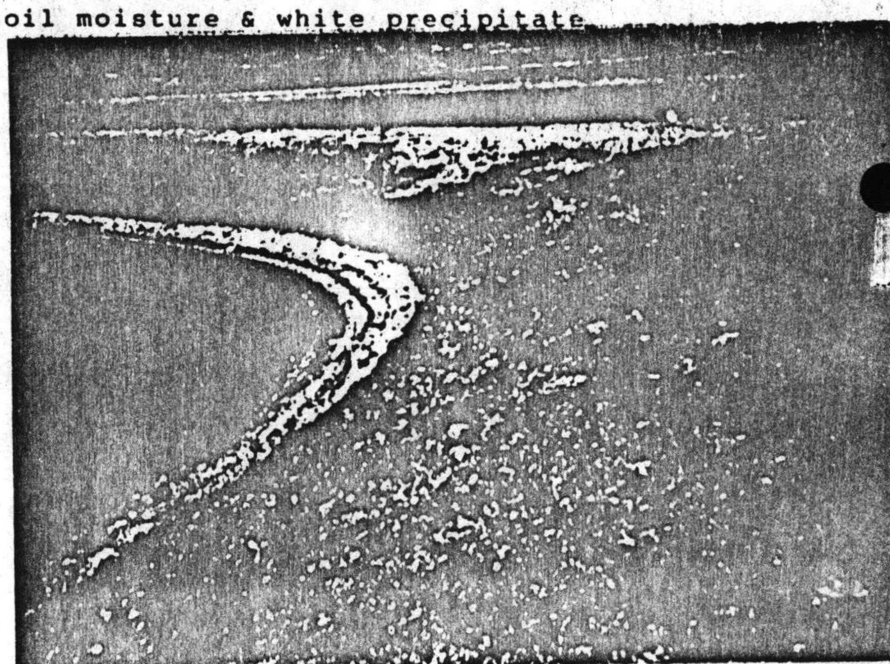
Pond 4, E end, S view,
soil moisture & white precipitate



Pond 4, E end,
white precipitate & soil moisture



Pond 4, E end, N view,
soil moisture & white precipitate



ATTACHMENT 7.

Document 5: Appendix C, Table C-1.

Well Designation Drinking Water Parameters (mg/l except as noted)	EPA PDWS	MW-12 Aug 20, 1986	MW-2 Aug. 20, 1986	MW-8 Aug. 20, 1986	MW-13 SPIKED MW-8 DUPLICATE	MW-9 Aug. 20, 1986	MW-10 Aug. 20, 1986	PDC 83 Aug. 20, 1986
Arsenic	.05	< .002	< .002	< .001	< .002	< .002	< .002	n/a
Barium	1.0	< .1	< .1	.5	.4	< .1	< .1	n/a
Cadmium	.01	< .01	< .01	< .01	< .01	< .01	< .01	n/a
Chromium	.05	< .02	< .02	.04	.04	< .02	< .02	n/a
Fluoride	4.0	.28	.26	.11	.11	.32	.26	n/a
Lead	.05	< .002	.002	.006	.007	< .002	< .002	n/a
Mercury	.002	.0002	.0002	< .0002	.0002	.0002	.0002	n/a
Nitrate (as NO3)	44.3	5.2	8.3	27	21	4.5	5.9	8.3
Selenium	.01	< .002	< .002	< .002	< .001	< .002	< .002	n/a
Silver	.05	< .01	< .01	.03	.03	< .01	< .01	n/a
Endrin (ug/l)	.2	< .1	< .1	< .1	1.2*	< .1	< .1	n/a
Lindane (ug/l)	4.0	< .05	< .05	< .05	.11*	< .05	< .05	n/a
Methoxychlor (ug/l)	100	< .2	< .2	< .2	2.7*	< .2	< .2	n/a
Toxaphene (ug/l)	5.0	< 1	< 1	< 1	4.6*	< 1	< 1	n/a
2,4-D (ug/l)	100	< .5	< .5	< .5	53*	< .5	< .5	n/a
2,4,5-TP Silvex (ug/l)	10	< .2	< .2	< .2	4.9*	< .2	< .2	n/a
Radium (pCi/l)	5	< 1+1.0	< 1+1.0	< 1+1.0	< 1+1.0	< 1+1.0	< 1+1.0	n/a
Gross Alpha (pCi/l)	15	< 1+1.9	< 1+1.7	< 1+3.9	< 1+2.8	< 1+1.8	< 1+1.8	n/a
Gross Beta (pCi/l)	50	< 1+15	< 1+14	< 1+35	< 1+36	< 9+16	< 1+14	n/a
Coliform (MPN/0.1L)	1	< 2	< 2	110§	< 2	< 2	< 2	n/a
Groundwater Quality Parameters (mg/l)								
Chloride		160	128	6300	6340	292	175	11300
Iron		3.2	.04	29	31	6.5	.11	.38
Manganese		.05	< .01	.33	.36	.14	< .02	.03
Phenols		< .005	< .005	< .005	< .005	< .005	< .005	n/a
Sodium		71	68	320	290	110	78	9500
Sulfate		159	115	340	340	180	144	4730
Groundwater Contamination Indicators								
pH, Lab								9.3
1st Replicate		7.4	7.4	7.1	7.1	7.6	7.4	n/a
2nd Replicate		7.3	7.3	7.1	7.1	7.6	7.5	n/a
3rd Replicate		7.3	7.4	7.1	7.1	7.6	[illegible]	n/a
4th Replicate		7.3	7.4	7.1	7.1	7.5	7.4	n/a
Specific Conductance, Lab (umhos/cm)								36400
1st Replicate		990	880	12000	11500	1380	1050	n/a
2nd Replicate		990	850	12000	11500	1350	1040	n/a
3rd Replicate		990	860	12000	11500	1350	1040	n/a
4th Replicate		990	860	12100	11500	1350	1040	n/a
Total Organic Carbon (TOC, mg/l)								
1st Replicate		< 5	< 5	< 5	< 5	< 5	< 5	n/a
2nd Replicate		n/a	n/a	n/a	n/a	n/a	n/a	n/a
3rd Replicate		n/a	n/a	n/a	n/a	n/a	n/a	n/a
4th Replicate		n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total Organic Halogens (TOX, mg/l)								
1st Replicate		< .1	< .1	< .1	< .1	< .1	< .1	n/a
2nd Replicate		< .1	< .1	< .1	< .1	< .1	< .1	n/a
3rd Replicate		< .1	< .1	< .1	< .1	< .1	< .1	n/a
4th Replicate		< .1	< .1	< .1	< .1	< .1	< .1	n/a
Additional Parameters (mg/l)								
Bicarbonate (as HCO3)		177	173	84	88	130	151	< 1.2
Carbonate (as CO3)		< .6	< .6	< .6	< .6	< .6	< .6	84.6
Hydroxide (as OH)		< .3	< .3	< .3	< .3	< .3	< .3	6.5
Calcium		111	83	1850	1600	141	110	763
Copper		< .02	< .02	.05	.05	< .02	< .02	.14
Hexavalent Chromium, Total		.01	< .01	.02	.05*	.02	< .02	n/a
Hexavalent Chromium, Dissolved		< .01	< .01	< .01	.03*	< .01	< .01	n/a
Magnesium		23	19	370	360	30	22	30
Phosphorous (as PO4)		.17	.04	2.2	2	.66	.09	n/a
Potassium		7.2	6	31	28	12	6.8	180
Zinc		< .01	< .05	.04	.03	< .01	< .02	.51
Total Dissolved Solids		640	520	9300	9300	960	680	25500

Notes: EPA PDWS: US Environmental Protection Agency Primary Drinking Water Standards
Gross beta standard is 4 millirem/yr (50 pCi/l)
§ shows value above PDWS
Metals analyzed on total recoverable basis
* spiked sample; see memorandum dated 9/16/86 on following pages
n/a sample not analyzed

Document 7; March, 1987 Results

BROWN AND CALDWELL LABORATORIES

1255 POWELL STREET EMERYVILLE CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-03-010

Received: 02 MAR 87
Reported: 30 MAR 87
Revised Report 05/05/87

Mr. Dan Griffin
PG&E, Dept. of Engineering Research
3400 Crow Canyon Road
San Ramon, California 94583

Purchase Order: Z19-5-046-83

Project: A047489

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED
03-010-1	P-1	27 FEB 87
03-010-2	MWP-12	28 FEB 87
03-010-3	MWP-3	27 FEB 87
03-010-4	MWP-8	27 FEB 87
03-010-5	MWP-9	27 FEB 87

PARAMETER	03-010-1	03-010-2	03-010-3	03-010-4	03-010-5
Alkalinity					
Carbonate Alk (as CaCO3), mg/L	<1	<1	<1	<1	<1
Bicarb Alk (as CaCO3), mg/L	146	150	147	72	118
Hydroxide Alk (as CaCO3), mg/L	<1	<1	<1	<1	<1
Total Alkalinity (as CaCO3), mg/L	146	150	147	72	118
Calcium (EDTA Titration), mg/L	105	118	90	1480	124
Magnesium, mg/L	17	19	15	550	24
Chloride, mg/L	143	184	124	5018	254
Copper, mg/L	<0.02	<0.02	<0.02	0.05	<0.02
Surfactants, mg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Iron, mg/L	<0.03	0.08	0.03	1.4	5.3
Manganese, mg/L	<0.01	<0.01	<0.01	0.03	0.07
Potassium, mg/L	9.2	10	8.4	61	14
Sodium, mg/L	68	74	63	290	92
Sulfate, mg/L	150	140	110	430	170
Filterable Residue (TDS), mg/L	580	650	520	9340	780
Zinc, mg/L	<0.01	<0.01	<0.01	0.03	<0.01
Nitrate (as NO3), mg/L	2.6	2.6	4.1	9.9	3.1
Nitric Acid Digestion, Date	03.03.87	03.03.87	03.03.87	03.03.87	03.03.87
General Mineral Approval, Date	03.17.87	03.17.87	03.17.87	03.17.87	03.17.87
Dissolved Hex Chromium, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01

Document 7; March, 1987 Results

BC BROWN AND CALDWELL LABORATORIES

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E87-03-010

Received: 02 MAR 87
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Mr. Dan Griffin
PG&E, Dept. of Engineering Research
3400 Crow Canyon Road
San Ramon, California 94583

Purchase Order: Z19-5-046-83

Project: A047489

REPORT OF ANALYTICAL RESULTS

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03-010-4	MWP-8	27 FEB 87
03-010-5	MWP-9	27 FEB 87

PARAMETER	03-010-1	03-010-2	03-010-3	03-010-4	03-010-5
Quadruplicate pH:					
pH, Average, Units	7.7	7.7	7.6	7.1	7.8
pH, Standard Deviation, Units	0.1	0.1	0.1	0.06	0.05
pH, 1st Replicate, Units	7.6	7.6	7.4	7.1	7.9
pH, 2nd Replicate, Units	7.7	7.8	7.6	7.0	7.8
pH, 3rd Replicate, Units	7.8	7.6	7.6	7.0	7.8
pH, 4th Replicate, Units	7.6	7.6	7.6	7.1	7.8
Fluoride, mg/L	0.33	0.28	0.33	0.12	0.33
Quadruplicate TOX:					
TOX, 1st Replicate, ug/L	<100	<100	<100	255	<100
TOX, 2nd Replicate, ug/L	<100	<100	<100	520	<100
TOX, 3rd Replicate, ug/L	<100	<100	<100	350	<100
TOX, 4th Replicate, ug/L	<100	<100	<100	384	<100
TOX, Average, ug/L	<100	<100	<100	377	<100
TOX, Standard Deviation, ug/L	0.0	0.0	0.0	110	0.0
Arsenic, mg/L	<0.001	0.002	<0.001	<0.001	<0.001
Barium, mg/L	<0.1	<0.1	<0.1	0.2	<0.1
Cadmium, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium, mg/L	<0.02	<0.02	<0.02	0.05	<0.02
Lead, mg/L	0.004	0.007	0.002	0.005	0.006
Mercury, mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Document 7; March, 1987 Results.

BROWN AND CALDWELL LABORATORIES

ANALYTICAL REPORT

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

LOG NO: E87-03-010

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REPORT OF ANALYTICAL RESULTS

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03-010-4	MWP-8	27 FEB 87
03-010-5	MWP-9	27 FEB 87

PARAMETER	03-010-1	03-010-2	03-010-3	03-010-4	03-010-5
Selenium, mg/L	<0.001	<0.001	0.002	<0.001	0.001
Silver, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Radioactivity					
Gross Alpha, pCi/L	<1±5.5	<1±4.9	<1±4.2	3±5.8	3±6.1
Gross Beta, pCi/L	5±4	4±4	5±4	11±10	4±4
Total Radium, pCi/L	<1±1.0	<1±1.0	<1±1.0	<1±1.0	<1±1.0
Total Coliform, MPN/0.1L	<2	<2	<2	<2	<2
Quadruplicate Conductivity:					
Sp. Cond., Average, umhos/cm	890	986	796	12590	1180
Sp. Cond., Std. Deviation, umhos/cm	21	45	28	0	34
Sp. Cond., 1st Replicate, umhos/cm	869	965	806	12590	1219
Sp. Cond., 2nd Replicate, umhos/cm	881	994	806	12590	1197
Sp. Cond., 3rd Replicate, umhos/cm	889	1045	818	12590	1158
Sp. Cond., 4th Replicate, umhos/cm	919	940	755	12590	1145

D[illegible]ument 7: June, 1987 Resul[illegible]

Well Designation		MP-12	MP-3	MP-8	[illegible]	MP-10	MP-13 SPIKE	P-1
Drinking Water Parameters (mg/l) except as noted	EPA PDWS	June 18 1987	June 18 1987	June 18 1987	June 17 1987	June 18 1987	P-1 DUPLICATE	June 18 1987
Arsenic	.05	.003	.003	.003	.004	.002	.005	.001
Barium	1.0	< .1	< .1	.5	< .1	< .1	< .1	< .1
Cadmium	.01	< .01	< .01	< .01	< .01	< .01	< .01	< .01
Chromium	.05	< .02	< .02	< .02	< .02	< .02	< .02	< .02
Fluoride	4.0	.59	.30	.10	.33	.33	.30	.33
Lead	.05	.002	.001	.001	.005	.005	.016	.002
Mercury	.002	< .0001	< .0001	< .0001	< .0001	< .0001	< .0001	< .0001
Nitrate (as NO3)	44.3	11	18	43	14	13	12	12
Selenium	.01	.003	.004	.003	.004	.004	.004	.004
Silver	.05	< .01	< .01	.01	< .01	< .01	< .01	< .01
Endrin (ug/l)	.2	< .1	< .1	< .1	< .1	< .1	< .1*	< .1
Lindane (ug/l)	4.0	< .5	< .5	< .5	< .05	< .05	< .05*	< .5
Methoxychlor (ug/l)	100	< .2	< .2	< .2	< .2	< .2	< .2*	< .2
Toxaphene (ug/l)	5.0	< 1	< 1	< 1	< 1	< 1	3.3*	< 1
2,4-D (ug/l)	100	< .5	< .5	< .5	< .5	< .5	.91*	< .5
2,4,5-TP Silvex (ug/l)	10	< .1	< .1	< .1	< .1	< .1	.21*	< .1
Radium (pCi/l)	5	< 1+1.0	< 1+1.0	1.3+1.0	< 1+1.0	< 1+1.0	< 1+1.0	< 1+1.0
Gross Alpha (pCi/l)	15	1+2	< 1+2	< 1+14	< 1+3	< 1+3	< 1+2	< 1+3
Gross Beta (pCi/l)	50	1+9	< 1+9	20+30	< 1+8	< 1+10	< 1+9	< 1+9
Coliform (MPN/0.1L)	1	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Groundwater Quality Parameters (mg/l)								
Chloride		162	126	6155	210	170	144	153
Iron		< .03	< .03	.66	.70	.13	< .03	< .03
Manganese		.01	< .01	.05	.09	< .01	< .01	< .01
Phenols		< .005	< .005	< .005	< .005	< .005	< .005	< .005
Sodium		65	58	270	77	70	63	64
Sulfate		130	110	460	150	150	140	140
Groundwater Contamination Indicators								
pH, Lab								
1st Replicate		7.3	7.3	6.9	7.4	7.2	7.2	7.2
2nd Replicate		7.3	7.3	6.9	7.4	7.2	7.2	7.2
3rd Replicate		7.2	7.3	6.9	7.4	7.3	7.2	7.3
4th Replicate		7.2	7.3	6.9	7.4	7.2	7.2	7.3
Specific Conductance, Lab (umhos/cm)								
1st Replicate		970	900	15400	1170	1060	990	1130
2nd Replicate		980	900	15300	1170	1060	990	1140
3rd Replicate		1050	900	15300	1170	1060	1000	1140
4th Replicate		1060	900	15300	1170	1060	990	1140
Total Organic Carbon (TOC, mg/l)								
1st Replicate		< 1	< 1	< 1	< 1	< 1	< 1	< 1
2nd Replicate		< 1	< 1	< 1	< 1	< 1	< 1	< 1
3rd Replicate		< 1	< 1	< 1	< 1	< 1	< 1	< 1
4th Replicate		< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Organic Halogens (TOX, mg/l)								
1st Replicate		< .025	< .025	.31	< .025	< .025	< .025	< .025
2nd Replicate		< .025	< .025	.42	< .025	< .025	< .025	< .025
3rd Replicate		< .025	< .025	.15	< .025	< .025	< .025	< .025
4th Replicate		< .025	< .025	.23	< .025	< .025	< .025	< .025
Additional Parameters (mg/l)								
Bicarbonate (as HCO3)		180	179	73	149	154	176	173
Carbonate (as CO3)		< .6	< .6	< .6	< .6	< .6	< .6	< .6
Hydroxide (as OH)		< .3	< .3	< .3	< .3	< .3	< .3	< .3
Calcium		100	84	2333	100	95	92	93
Copper		< .02	< .02	.04	< .02	< .02	< .02	< .02
Hexavalent Chromium, Total		< .01	.01	.02	.01	.01	.09*	< .01
Hexavalent Chromium, Dissolved		< .01	< .01	< .01	< .01	< .01	.08*	< .01
Magnesium		22	19	540	27	23	25	23
Phosphorous (as PO4)		.16	.30	.12	.49	.23	.11	.12
Potassium		6.6	6.1	37	10	7.1	6.9	6.6
Zinc		< .01	< .01	< .01	< .01	< .01	< .01	< .01
Total Dissolved Solids		610	510	10600	690	660	680	600

Notes: EPA PDWS: US Environmental Protection Agency Drinking Water Standard
Gross Beta standard is 4 millirem/yr (50Ci/l)
[illegible] shows value above PDWS
Metals analyzed on total recoverable basis
* spiked sample

ATTACHMENT 8.

L... 10-14-87

CA T080011729

INSPECTOR Joseph Desai
David Schwartzbart

Inspection Report
U.S. Environmental Protection Agency
Region 9
Toxics and Waste Management Division
Field Operations Branch

(DOHS - SCS)

Purpose: Annual Compliance Evaluation Inspection

Facility Name: P G & E Topock Compressor Station

Street: 14 miles southeast of Needles on I-40

City: Needles **State:** California **Zip Code:** 92363

EPA ID number: CAT 080011729

Report Number:

Date of Investigation: Oct. 14, 1987

EPA Inspector(s): None

State Inspector(s): Joseph Desai
David Schwartzbart

Facility Representative(s): Rex Avila
James Soden
John hesworth
Todd Hogenson

Report Prepared By: Joseph Desai/David Schwartzbart

10-14-87

CA T080011729

INSPECTOR JD, DS

Form A - Interim Status Standards for Facilities that Treat, Store or Dispose of Hazardous Waste

I. General Information:

(A) Operator: James Soden

Street: P.O. BOX 337

City: Needles State: CA Zip Code: 92363

(B) Owner: Pacific Gas and Electric

Street: 77 Beale Street

City: San Francisco State: CALIF. Zip Code: 94106

(C) Site Activity: Compressor station for gas transmission

✓ Generation: Complete Form B

___ Transportation: Complete Form C

___ Small Quantity Generator: Complete Form D

___ Recycler: Complete Form E

Storage:

___ Container (S01)

___ Tank (S02)

___ Waste Pile (S03)

___ Surface Impoundment (S04)

Disposal:

___ Injection Well (D79)

___ Landfill (D80)

___ Land Application (D81)

___ Ocean Disposal (D82)

X Surface Impoundment (D83)

Treatment:	Process Code:	Design Capacity:
___ Tank (T01)		
___ Surface Impoundment (T02)		
___ Incinerator (T03)		
___ Other (T04)		

10-14-87

CA T080011729

INSPECTOR J.D., DS

I. General Information: - Continued

(D) Nature Of Business:

Please refer to the Inspection Report

(E) Description Of Facility Processes:

DATE 10-14-87

CA T080011729

INSPECTOR J.D., D.S.

I. General Information: - Continued

(F) Report Attachments:

10-14-87

CA T080011729

INSPECTOR JD DS

II. Interim Status:
(Part 270 Subpart G)

	Yes	No	Comments
(A) Qualifying For Interim Status:			
1. For the existing facility to be treated as having been issued a permit, the facility must have:			
a. Submitted a notification of H.W. activity (270.70a.1)?	✓		
b. Submitted Part A of the permit application (270.70a.2)?	X		
c. Achieved compliance with RCRA interim status standards (270.70b)?	X		
(B) Operating During Interim Status:			
1. Has the facility complied with the following restrictions:			
a. Has only treated, stored or disposed of H.W. specified in the Part A (270.71a.1)?	X		
b. Has only employed processes specified in the Part A (270.71a.2)?	X		
c. Has not exceeded design capacities specified in the Part A (270.71a.3)?	X		
(C) Changes During Interim Status:			N/A Facility undergoing closure.
1. Has a revised Part A been submitted prior to the following changes:			
a. T/S/D of H.W. not previously identified in the Part A (270.72a)?			
b. Increases in design capacity of processes (270.72b)?			
c. Changes in or additions to processes (270.72c)?			
d. Change in ownership (270.72d)?		X	
2. Have the changes made not amounted to reconstruction (270.72e)?			

10-14-87

CA T080011729

INSPECTOR J.D., DS

III. General Facility Standards:
(Part 265 Subpart B)

	Yes	No	Comments
(A) Required Notices:			
1. Has the RA been notified regarding the receipt of H.W. from a foreign source (265.12a)?			NA Not an off-site facility
2. Before transferring ownership, has the facility notified the new owners in writing of the requirements of Parts 265 and 122 (265.12b)?			NA
(B) General Waste Analysis:			
1. Has the facility obtained a detailed chemical and physical analysis of each H.W. (265.13a.1)?	X		
2. Does the analysis contain all information that must be known to properly treat, store or dispose of the H.W. (265.13a.1)?	X		
3. Does the facility have records documenting the required H.W. analysis, e.g., lab reports, published data, generator supplied data (265.13a.2)?	X		
4. Has the analysis been repeated to ensure that it is accurate and up-to-date (265.13a.3)?	X		
5. Is the analysis repeated when there is a change in the process (265.13a.3)?	X		
6. For off-site facilities, is the analysis repeated when the H.W. received does not match the H.W. designated on the manifest (265.13a.3)?			N/A Not an off-site facility.
7. For off-site facilities, does the facility inspect or analyze each movement of H.W. to verify that the H.W. received matches the identity of the H.W. specified on the manifest (265.13a.4)?			

DATE: 10-14-87

CA T080011729

INSPECTOR: JD, DS

III. General Facility Standards: - Continued
(Part 265 Subpart B)

	Yes	No	Comments
8. Does the facility have a detailed waste analysis plan (265.13b)?	X		
9. Does the facility follow the procedures specified in the waste analysis plan (265.13b)?	X		
10. Does the waste analysis plan contain the following elements:			
a. Parameters of analysis of each H.W. handled (265.13b.1)?	X		
b. Rationale for the selection of each parameter (265.13b.2)?	X		
c. Test methods used to obtain a representative sample of H.W. (265.13b.3)?	X		
d. Frequency which each analysis will be repeated (265.13b.4)?	X		
e. For off-site facilities, the analysis that generators have agreed to supply (265.13b.5)?			N.A.
11. For off-site facilities, does the plan specify procedures for inspection or analysis of each movement of H.W. (265.13c)?			
12. For off-site facilities, does the plan contain the following elements:			
a. Description of procedures used to identify each movement of H.W. (265.13c.1)?			
b. Description of the sampling method used to obtain a representative sample of the H.W. (265.13c.2)?			

(C) Security:

	Yes	No	Comments
1. Do security measures include:			
a. 24-hour surveillance (265.14b.1)?	X		

10-14-87

CA T0000:1729

INSPECTOR J.D., D.S

III. General Facility Standards: - Continued
(Part 265 Subpart B)

	Yes	No	Comments
b. Artificial or natural barriers and controlled entry (265.14b.2)?	X		
c. Signs with the legend "Danger-Unauthorized Personnel Keep Out" posted at entrances to active portions of facility (265.14c)?	X		
(D) General Inspection Requirements:			
1. Does the facility inspect for equipment malfunctions and deterioration, operator errors, and H.W. discharges (265.15a)?	X		
2. Does the facility follow a written inspection schedule (265.15b.1)?	X		
3. Is the schedule kept at this facility (265.15b.2)?	X		
4. Does the schedule identify types of problems that are expected from malfunction, operator error, deterioration or discharges of all: (265.15b.3)			
a. monitoring equipment?	X		
b. safety, emergency equipment?	X		
c. security equipment?	X		
d. operating and structural equipment?	X		
5. Does the schedule indicate the frequency of inspection for each item (265.15b.4)?	X		
6. Does the schedule include daily inspections of loading and unloading areas (265.15b.4)?	X		
7. Has the facility taken remedial action to correct the problems revealed on an inspection (265.15c)?	X		

DATE 10-14-87

CA T 0800:1729

INSPECTOR JD, DB

III. General Facility Standards: - Continued
(Part 265 Subpart B)

	Yes	No	Comments
8. Are inspections recorded in an inspection log (265.15d)?	X		
9. Does the log include: (265.15d)			
a. Date and time of inspection?	X		
b. Name of inspector?	X		
c. Observations recorded?	X		
d. Date and nature of repairs or other remedial actions?	X		
10. Are inspection records kept for at least 3 years (265.15d)?	X		
(E) Personnel Training:			
1. Does the facility have a personnel training program (265.16a.1)?	X		They have weekly safety meetings and mandatory monthly safety meetings
2. Is it directed by a person trained in H.W. management procedures (265.16a.2)?	X		
3. Does the program include training in: (265.16a.3)			
a. Procedures for using, inspecting, repairing and replacing emergency and monitoring equipment?	X		
b. Emergency procedures including contingency plan implementation?	X		
4. Do new personnel receive required training within 6 months (265.16b)?	X		
5. Do personnel take part in an annual review of the initial training (265.16c)?	X		

DATE: 10-14-87

CA T080011729

INSPECTOR: J.D. D.S

III. General Facility Standards: - Continued
(Part 265 Subpart B)

	Yes	No	Comments
6. Do personnel training records include: (265.16d)			
a. Job titles?	X		
b. Job Descriptions?	X		
c. Descriptions of training?	X		
b. Records of training?	X		
(F) Requirements For Ignitable, Reactive, Or Incompatible Wastes:			
1. Are the following precautions taken to prevent accidental ignition or reaction: (265.17a)			
a. Separation and protection from ignition sources?			N.A. No reactive/ignitable waste
b. No smoking signs in hazard areas?	X		
2. Is the T/S/D of ignitable, reactive and incompatible waste conducted so that it does not: (265.17b)			
a. Generate extreme heat or pressure, fire or explosion, or violent reaction?			N.A.
b. Produce uncontrolled toxic or flammable mists, fumes, dusts or gases?			
c. Damage structural integrity of H.W. containment devices? (e.g., tanks, containers, liners)			
d. Threaten human health or the environment?			

10-14-87

CA T080011729

INSPECTOR JD, DS

IV. Preparedness and Prevention: (Part 265 Subpart C)

	Yes	No	Comments
(A) Is the facility designed, constructed, maintained, and operated to minimize the possibility of fire, explosion, or releases of H.W. or H.W. constituents to air, soil, or surface water which could threaten human health or the environment (265.31)?	X		
(B) Required Equipment:			
1. Does the facility have the following equipment where applicable:			
a. Internal communications or alarm systems (265.32a)?	X		
b. Telephone or 2-way radios at the scene of operation (265.32b)?	X		
c. Portable fire extinguishers with water, foam, inert gas, dry chemical; spill control and decontamination equipment (265.32c)?	X		
d. Water at adequate volume and pressure or foam producing equipment or automatic sprinklers (265.32d)?	X		
(C) Testing And Maintenance Of Equipment:			
1. Does the facility test and maintain emergency equipment in operable condition (265.33)?	X		
(D) Access To Communications Or Alarm Systems:			
1. Do personnel in areas where H.W. is being handled have immediate access to these systems (265.34)?	X		
(E) Required Aisle Space:			
1. Is their adequate aisle space for unobstructed movement of fire, spill control and decontamination equipment in an emergency (265.35)?	X		

IV. Preparedness and Prevention: - Continued
(Part 265 Subpart C)

	Yes	No	Comments
(F) Arrangements With Local Authorities:			
1. Has the facility made the following arrangements:			
a. Arrangements to familiarize police, fire dept., and emergency response team with H.W. operations (265.37a.1)?	X		
b. Agreements designating primary emergency authority (265.37a.2)?	X		
c. Agreements with State emergency response teams, contractors and equipment suppliers (265.37a.3)?	X		
d. Arrangements to familiarize local hospitals with the properties of H.W. and the types of potential injuries and illnesses from exposure to H.W. (265.37a.4)?	X		
2. Did the facility document in the operating record any refusal by State or local authorities to enter into such arrangements (265.37b)?		X	There has been no such refusal thus far.

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INSPECTOR J.D., DS

V. Contingency Plan and Emergency Procedures
(Part 265 Subpart D)

	Yes	No	Comments
(A) Does the facility have a contingency plan (265.51a)?	X		
(B) Content Of Contingency Plan:			
1. Does the plan describe actions personnel must take to comply with SS 265.51 & 265.56 in response to fires, explosions, or unplanned releases of H.W. (265.52a)?	X		
2. Does the plan describe arrangements agreed by police, fire dept., hospitals, contractors, and State and local emergency response teams to coordinate emergency services pursuant to S 265.37 (265.52c)?	X		
3. Does the Plan list names, addresses, and phone numbers (office & home) of all persons qualified to act as emergency coordinators (265.52d)? (list in order of responsibility)	X		
4. Does the plan list all emergency equipment including the location and physical description of each item on the list and a brief outline of its capability (265.52e)?	X		
5. Does the plan include an evacuation plan for personnel and a description of signals to begin evacuation, evacuation routes and alternate routes (265.52f)?	X		
(C) Copies of Contingency Plan:			
1. Is the plan maintained at the facility (265.53a)?	X		
2. Has the plan been submitted to all local emergency organizations (265.53b)?	X		

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INSPECTOR DS, JD

V. Contingency Plan and Emergency Procedures: - Con't.
(Part 265 Subpart D)

	Yes	No	Comments
(D) Amendment Of Contingency Plan:			
1. Has the plan been reviewed and immediately amended when required (265.54)?	X		
(E) Emergency Coordinator:			
1. Is the coordinator familiar with all aspects of site operation and emergency procedures (265.55)?	X		
2. Does the coordinator have authority to carry out the contingency plan (265.55)?	X		
(F) Emergency Procedures:			
1. If an emergency situation has occurred at this facility, has the emergency coordinator followed the emergency procedures listed in § 265.56 (265.56)?			N.A. No emergency situation has arisen thus far

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INSPECTOR J.D., DS

VI. Manifest System, Recordkeeping, and Reporting:
(Part 265 Subpart E)

	Yes	No	Comments
(A) Use of Manifest System:			
1. Does the facility comply with the following manifest requirements:			
a. Sign and date each copy of the manifest (265.71a.1)?	X		
b. Note any significant * discrepancies in the manifest (265.71a.2)?	X		
c. Give transporter one copy of the signed manifest (265.71a.3)?	X		
d. Within 30 days after delivery, send a copy of the manifest to the generator (265.71a.4)?	X		
2. Are records of past shipments retained for 3 years (265.71a.5)?	X		
(B) Manifest Discrepancies:			
1. Upon discovering a significant discrepancy, has the facility made an attempt to reconcile the discrepancy with the generator or transporter (265.72b)?			N.A. No discrepancies thus far
2. For discrepancies not reconciled within 15 days, has the facility followed the required reporting procedures (265.72b)?			
(C) Operating Record:			
1. Does the facility maintain an operating record (265.73a)?	X		

* Significant discrepancies are:
1. For bulk waste; variations > 10% in weight
2. For containerized waste; variations > one drum
3. Obvious differences such as waste solvent substituted for waste acid

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INSPECTOR J.D., D.S.

VI. Manifest System, Recordkeeping, and Reporting: - Con't
(Part 265 Subpart E)

	Yes	No	Comments
2. Does the operating record contain the following information:			
a. A description and the quantity of each waste received (265.73b.1)?	X		
b. The method(s) and date(s) of its treatment, storage or disposal as required by Appendix I (265.73b.1)?	X		
c. The location of each waste within the facility and the quantity at each location (265.73b.2)? (This information must include cross-references to specific manifest numbers.)	X		
d. For disposal facilities, the location and quantity of each waste is recorded on a map or diagram of each cell or disposal area (265.73b.2)?			N.A. - Not a disposal facility
e. Records and results of all waste analysis and trial tests (265.73b.3)?	X		
f. Reports detailing all incidents that required implementation of the contingency plan (265.73b.4)?			N.A. Implementation of contingency plan not needed thus far.
g. Records and results of operator inspections (265.73b.5)?	X		
h. Monitoring data (265.73b.6)?	X		
I. All closure and post-closure costs as applicable (265.73b.7)?	X		
(D) Availability, Retention, Disposition Of Records:			
1. Are all records including plans available for inspection (265.74a)?	X		
2. Have copies of records of H.W. disposal locations and quantities under § 265.73b.2 been submitted to the RA and local land authority upon closure of the facility (265.74c)?	X		

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INSPECTOR JD, DS

VI. Manifest System, Recordkeeping, and Reporting: - Con't.
(Part 265 Subpart E)

	Yes	No	Comments
(E) Biennial Report:			
1. Has the facility submitted a biennial report to the RA by March 1 of each even numbered year (265.75)?	X		
2. Was the report submitted on EPA form 8700-13B and cover facility activities during the previous calendar year (265.75)?	X		
3. Does the report include the following infromation: (265.75)			
a. EPA identification number, name and address of the facility?	X		
b. Calendar year covered by report?	X		
c. For off-site facilities, the EPA identification number of each generator?			N.A. not an offsite facility
d. Description and quantity of each H.W. received and, for off-site facilities, the EPA identification number of each generator listed with this information?	X		
e. Methods of treatment, storage, or disposal for each H.W.?	X		
f. Monitoring data under § 265.94a.2.ii and iii and b.2 ?	X		
g. Most recent closure and post-closure cost estimates?	X		
h. Required certification?	X		

VI. Manifest System, Recordkeeping, and Reporting: - Con't
(Part 265 Subpart E)

	Yes	No	Comments
(F) Unmanifested Waste Report:			
1. For a facility that has accepted a H.W. from an off-site source without an accompanying manifest, was a report containing the required information submitted to the RA within 15 days after receiving the H.W. (265.76a-g)?	__	__	NA. Not an off-site facility
(G) Additional Reports:			
1. Has the facility reported to the RA: (265.77)			NA
a. Releases, fires and explosions?	__	__	
b. Ground-water contamination and monitoring data?	__	__	Under review
c. Facility closure?	__	__	

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INSPECTOR J.D., D.S.

VII. Ground-Water Monitoring:*
(Part 265 Subpart F)

	Yes	No	Comments
(A) Has a ground-water monitoring program (capable of determining the facility's impact on the quality of ground-water in the uppermost aquifer underlying the facility) been implemented (265.90a)?		X	-site characterization & definition of uppermost aquifer inadequate -see narrative
(B) Ground-Water Monitoring System:			
1. Has at least one monitoring well been installed in the uppermost aquifer hydraulically upgradient from the limit of the waste management area (265.91a.1)?		X	
a. Are ground-water samples from the uppermost aquifer representative of background ground-water quality and not affected by the facility? (as ensured by proper well number, locations and depths) (265.91a.1)		X	
2. Have at least three monitoring wells been installed hydraulically downgradient at the limit of the waste management area (265.91a.2)?	X		
a. Do well numbers, locations and depths ensure prompt detection of any statistically significant amounts of H.W. or H.W. constituents that migrate from the waste management area to the uppermost aquifer (265.91a.2)?		X	
3. Have the locations of the waste management areas been verified to conform with information in the ground-water program (265.91b)?	X		
a. If the facility contains multiple waste ma[nage]ment components, is each component adequately monitored (265.91 b & b.2)?		X	

* basis for Section VII evaluation discussed in narrative

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VII. Ground-Water Monitoring: - Continued INSPECTOR JD, DJ
(Part 265 Subpart F)

	Yes	No	Comments
4. Do the numbers, locations, and depths of the monitoring wells agree with the data in the ground-water monitoring system program (265.91b)?	X		
5. Well completion details: (265.91c)			
a. Are wells properly cased?	X		
b. Are wells properly screened and packed where necessary to enable sampling at appropriate depths?		X	-screen lengths not uniform & possibly wrongly placed - see narr.
c. Are annular spaces properly sealed to prevent contamination of ground-water?	X		
(C) Sampling And Analysis:			
1. Has a ground-water sampling and analysis plan been developed (265.92a)?	X		
a. Has it been followed?	X		except: weather conditions were not recorded on the H_2O level Record form
b. Is the plan kept at the facility?	X		
c. Does the plan include procedures and techniques for:			
i. Measurement of ground-water surface elevations (265.92a.1)?	X		
ii. Sample collection (265.92a.1)?	X		
iii. Sample preservation (265.92a.2)?	X		
iv. Sample shipment (265.92a.2)?	X		
v. Analytical procedures (265.92a.3)?	X		
vi. Chain of custody control (265.92a.4)?	X		

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INSPECTOR JD, DS

VII. Ground-Water Monitoring: - Continued
(Part 265 Subpart F)

	Yes	No	Comments
2. Are the required parameters in ground-water samples being tested quarterly for the first year (265.92b and 265.92c.1)?	___	X	following deficiencies noted:
a. Are the ground-water samples analyzed for parameters characterizing the suitability of the ground-water as a drinking water supply * (265.92b.1)?	___	X	Hg & coliform bacteria omitted
b. Are the ground-water samples analyzed for parameters establishing ground-water quality * (265.92b.2)?	X	___	
c. Are the ground-water samples analyzed for parameters used as indicators of ground-water contamination * (265.92b.3)?	X	___	
2. For each indicator parameter are at least four replicate measurements obtained at each upgradient well for each sample obtained during the first year of monitoring (265.92c.2)?	___	X	4th replicate values for TOX omitted
3. Are provisions made to calculate the initial background arithmetic mean and variance of the respective parameter concentrations or values obtained from the upgradient well(s) during the first year (265.92c.2)?	X	___	

* EPA interim primary drinking water standards:
Arsenic, Barium, Cadmium, Chromium, Fluoride, Lead, Mercury, Nitrate(as N), Selenium, Silver Endrin, Lindane, Methoxychlor, Toxaphene, 2-4 D, 2,4,5-TP Silver, Radium, Gross Alpha, Gross Beta, Turbidity, Coliform Bacteria.

Parame[illegible] establishing ground-water quality:
Chloride, Iron, Manganese, Phenols, Sodium, Sulfate.

Parameters used as indicators of ground-water contamination:
[illegible], Specific Conductance, Total Organic Carbon, Total Organic Halogen.

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INSPECTOR JD DS

VII. Ground-Water Monitoring: - Continued
(Part 265 Subpart F)

	Yes	No	Comments
4. For facilities which have completed first year ground-water sampling and analysis requirements:			
a. Have samples been obtained and analyzed for the ground-water quality parameters at least annually (265.92d.1)?	X		
b. Have samples been obtained and analyzed for the indicators of ground-water contamination at least semi-annually (265.92d.2)?	X		
5. Were ground-water surface elevations determined at each well each time a sample was taken (265.92e)?	X		
D) Preparation, Evaluation, And Response:			
1. Has an outline of a ground-water quality assessment program been prepared (265.93a)?			NA: in detection phase
a. Does it describe a program capable of determining:			
i. Whether H.W. or H.W. constituents have entered the ground-water (265.93a.1)?			
ii. The rate and extent of migration of H.W. or H.W. constituents (265.93a.2)?			
iii. Concentrations of H.W. or H.W. constituents in ground-water (265.93a.3)?			
2. After the first year of monitoring, have at least 4 replicate measurements of each indicator parameter been obtained for samples taken for each well (265.93b)?	X		

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INSPECTOR JD, DS

VII. Ground-Water Monitoring: - Continued (Part 265 Subpart F)

	Yes	No	Comments
a. Were the results compared with the initial background means from the upgradient well(s) determined during the first year (265.93b)?	X		
i. Was each well considered individually (265.93b)?	X		
ii. Was the Student's t-test used (at the 0.01 level of significance) (265.93b)?	X		
b. Was a significant increase (or pH decrease) found in the:			
i. Upgradient wells?		X	
ii. Downgradient wells?	X		origin of high levels in MWP-8 is unknown.
If "Yes", complete the Compliance Form For A Facility Which May Be Affecting Ground-Water Quality.			
3. Were the ground-water surface elevations evaluated annually to determine whether the monitoring wells are properly placed (265.93f)?	X		
4. If it was determined that modification of the number, location or depth of monitoring wells was necessary, was system brought into compliance with 265.91a (265.93f)?		X	enforcement action pending

(E) Recordkeeping And Reporting:

	Yes	No	Comments
1. Have records been kept of analysis for parameters in 265.92c and d (265.94a.1)?	X		
2. Have re[illegible]s been kept of ground-water surface elevations taken at the time of sampling for each well (265.94a.1)?	X		

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INSPECTOR JD, DS

VII. Ground-Water Monitoring: - Continued
(Part 265 Subpart F)

	Yes	No	Comments
3. Have records been kept of required evaluations in 265.93b (265.94a.1)?	X		
4. Have the following been submitted to the RA: (265.94a.2)			
a. Initial background concentrations of parameters listed in 265.92b within 15 days after completing each quarterly analysis required during the first year?	X		
b. For each well, have any parameters whose concentrations or values have exceeded the maximum contaminant levels allowed in drinking water supplies been separately identified?	X		
c. Annual reports including:			
i. Concentrations or values of parameters used as indicators of ground-water contamination for each well along with required evaluations under 265.93b?	X		
ii. Any significant differences from initial background values in upgradient wells separately identified?	X		
iii. Results of the evaluation of ground-water elevations?	X		

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INSPECTOR JD, DS

VII. Ground-Water Monitoring: - Continued
(Part 265 Subpart F)

Compliance Form For A Facility Which May Be Affecting Ground-Water Quality

	Yes	No	Comments
1. Have comparisons of ground-water contamination indicator parameters for the upgradient well(s) shown a significant increase (or pH decrease) over initial background?			NA; facility has not been shown to be affecting g.w. qual.
a. If "Yes", has this information been submitted to the RA according to 265.94a.2.ii (265.93c.1)?			
2. Have comparisons of indicator parameters for the downgradient wells shown a significant increase (or pH decrease) over initial background?			
a. If "Yes", were additional ground-water samples taken for those downgradient wells where the significant differences was determined (265.93c.2)?			
i. Were samples split in two?			
ii. Was the significant differences due to human (e.g., laboratory) error?			
If "Yes", do not continue			
3. If significant differences were not due to error, was a written notice sent to the RA within 7 days of confirmation (265.93d.1)?			
4. Within 15 days of notification to the RA was a certified ground-water quality assessment plan submitted (265.93d.			

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INSPECTOR JD, DS

VII. Ground-Water Monitoring: - Continued
(Part 265 Subpart F)

Compliance Form For A Facility Which May Be Affecting Ground-Water Quality

	Yes	No	Comments
5. Does the ground-water quality assessment plan specify: (265.93d.3)			NA; facility has not been shown to be affecting gw. qual.
a. Monitoring well information including well numbers, locations and depths?	___	___	
b. Sampling methods?	___	___	
c. Analytical methods?	___	___	
d. Evaluation methods?	___	___	
e. Schedule of implementation?	___	___	
6. Does the plan allow for determination of: (265.93d.4)			
a. Rate and extent of migration of H.W. or H.W. constituents?	___	___	
b. Concentrations of the H.W. or H.W. constituents?	___	___	
7. Is it indicated that the first determination was made as soon as technically feasible (265.93d.5)?	___	___	
a. Within 15 days after the first determination was a written report containing the assessment of ground-water quality submitted to the RA?	___	___	
8. Was it determined that H.W. or H.W. constituents from the facility have entered the ground-water?	___	___	
a. If "No", was the original indicator evaluation program, required by 265.92 and 265.93b, reinstated?	___	___	
b. Was the RA notified of the reinstatement of the program within 15 days of the determination (265.93d.6)?	___	___	

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INSPECTOR J.D., D.S.

VII. Ground-Water Monitoring: - Continued
(Part 265 Subpart F)

Compliance Form For A Facility Which May Be Affecting Ground-Water Quality

	Yes	No	Comments
9. If it was determined that H.W. or H.W. constituents have entered the ground-water: (265.93d.7)			NA; facility has not been shown to be affecting gw. qual.
a. For facilities where the program was implemented prior to final closure, are determinations of H.W or H.W. constituents continued on a quarterly basis (265.93d.7)? (If the program was implemented during the post-closure care period, determinations made in accordance with the ground-water quality assessment plan may cease after the first determination.)	___	___	
b. Were subsequent ground-water quality reports submitted to the RA within 15 days of determination (265.93d.7)?	___	___	
c. Were records kept of the analysis and evaluations specified in the ground-water quality assessment (throughout the active life of the facility) (265.94b.1)?	___	___	
d. If a disposal facility, were (are) records kept throughout the post-closure period as well (265.94b.1)?	___	___	
10. Are annual reports submitted to the RA containing the results of the ground-water quality assessment program (265.94b.2)?	___	___	
a. Do the reports include the calculated or measured rate of migration of H.W. or H.W. constituents during the reporting period (265.94b.2)?	___	___	

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INSPECTOR J.D., DS

VII. Ground-Water Monitoring: - Continued
(Part 265 Subpart F)

Compliance Form For Demonstrating A Waiver Of Interim Status Requirements

	Yes	No	Comments
1. Is a written waiver demonstration kept at the site (265.90c)?	___	___	NA, no waiver demonstrated
2. Is the demonstration certified by a qualified geologist or geotechnical engineer (265.90c)?	___	___	___
3. Does the waiver demonstration establish the potential for migration of H.W. or H.W. constituents from the facility to the uppermost aquifer (265.90c.1)?	___	___	___
a. Does the evaluation of a water balance include:			
i. Precipitation?	___	___	___
ii. Evapotranspiration?	___	___	___
iii. Runoff?	___	___	___
iv. Infiltration? (including any liquid in surface impoundments)	___	___	___
b. Does the evaluation of the unsaturated zone characteristics include:			
i. Geologic Materials?	___	___	___
ii. Physical Properties?	___	___	___
iii. Depth to ground-water?	___	___	___
4. Does the waiver demonstration establish the potential for H.W. or H.W constituents which may enter the uppermost aquifer to migrate to a water supply well or surface water (265.90c.2)?	___	___	___
a. Does the evaluation of the saturated zone characteristics include?			
i. Geologic materials?	___	___	___
ii. Physical properties?	___	___	___
iii. Rate of ground-water flow?	___	___	___
iv. Proximity of the facility to water supply wells or surface water?	___	___	___

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INSPECTOR JD, DS

VIII. Closure and Post-Closure:
(Part 265 Subpart G)

	Yes	No	Comments
(A) Closure Plan:			At the time of inspection the closure plan was under review by facility permitting unit. It is now approved on oct. 20, 87
1. Does the facility have a closure plan (265.112a)?			
2. Does the plan identify the steps necessary to completely or partially close the facility at any point during its intended operating life and to completely close at the end of its intended operating life (265.112a)?			
3. Do the steps to close in the plan include: (265.112a)			
a. Pre-treatment of H.W.?			
b. Treatment of H.W.?			
c. Removal of H.W. from process units?			
d. Disposal of H.W.?			
e. Decontamination of equipment and structures?			
f. Scheduled inspections for closure certification purposes?			
3. Does the description of how and when the facility will be closed include the following elements:			
a. Maximum extent of operation which will be unclosed during the life of the facility (265.112a.1)?			
For facilities that have designated H.W. management areas inactive prior to Nov. 19, 1980, are records available documenting the cessation of activity or final closure?			
Was a Notification of Hazardous Waste Site submitted to EPA as required by § 103c of CERCLA ?			

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INSPECTOR JD, DS

VIII. Closure and Post-Closure: - Continued
(Part 265 Subpart G)

	Yes	No	Comments
b. Estimate of the maximum inventory of H.W. in storage and in treatment at any time during the life of the facility (265.112a.2)?			closure plan approved by FPU on oct. 20, 87
c. Does the inventory include the maximum amount of on-site:			
H.W. in surface impoundments?			
H.W. in tanks?			
H.W. in piles?			
H.W. in containers?			
H.W. in drainage pits or sumps?			
Contaminated soil from spills or leaks?			
Contaminated soils and liners from non-disposal impoundments?			
Contaminated soils from land treatment fields?			
Decontamination residues?			
Process residues?			
Other (specify)?			
d. Decontamination procedures including: (265.112a.3)			
A list of equipment, containers, structures requiring decontamination?			
Sampling and analytical methods for determining whether soil contamination or decontamination residues are H.W.?			
Testing criteria for determining adequacy of clean-up?			
Methods of treatment or disposal of contaminated soils and residues?			

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INSPECTOR J.D, D.S

VIII. Closure and Post-Closure: - Continued (Part 265 Subpart G)

	Yes	No	Comments
e. Estimate of the expected year of closure (265.112a.4)?			Closure plan approved
f. Schedule for final closure activities (265.112a.4)?			by FPV on oct 20, 1987
g. Does the schedule include:			
Total time required to close?			
Time required for intervening closure activities? (e.g., Time required for H.W. treatment, disposal, decontamination, and certification inspections.)			
4. Has the facility amended the plan whenever changes in operating practice or process design affect the plan or there is a change in the expected year of closure (265.112b)? (Plan must be amended within 60 days of the changes.)			
5. Has the facility submitted a closure plan to the RA at least 180 days before the date they expect to begin closure (265.112c)?			
(B) Time Allowed For Closure:			
1. Does the schedule for final closure allow for the following:			
a. Treatment, removal, or disposal of H.W. within 90 days after receipt of final volume of H.W. or after approval of closure plan (265.113a)?			
b. Completion of closure plan activities within 180 days after receipt of final volume of H.W. or after approval of closure plan (265.113b)?			

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INSPECTOR J.D., DS

VIII. Closure and Post-Closure: - Continued
(Part 265 Subpart G)

	Yes	No	Comments
(C) Disposal And Decontamination Of Equipment:			Closure plan Approved by EPA on Oct. 20, 1987
1. For facilities that have completed closure activities, has all equipment and structures been properly disposed of or decontaminated by removing all H.W. and contaminated residues (265.114)?			
(D) Certification Of Closure:			
1. For facilities that have completed closure activities, has a certification by owner/operator and an independent registered professional engineer been submitted to the RA (265.115)?			
(E) Partial Closure:			
1. Does the facility plan to close discreet regulated H.W. manage-units during the intended operating life?			

If "Yes" complete compliance form for partial closure.

VIII. Closure and Post-Closure: - Continued
(Part 265 Subpart G)

Compliance Form For Partial Closure

	Yes	No	Comments
(E) Partial Closure:			N.A at this time
1. Does the closure plan describe how the facility will be partially closed (265.112a.1)?	___	___	
2. Does the plan describe the size of areas partially closed?	___	___	
3. Does the plan describe the procedures for partial closure?	___	___	
4. Does the plan address maintenance activities, including: (265.112a.1)			
a. Visual inspections?	___	___	
b. Ground-water monitoring?	___	___	
c. Maintaining cover?	___	___	
d. Maintaining diversion structures?	___	___	
e. Controlling erosion?	___	___	
f. Maintaining vegetation?	___	___	
g. Maintaining site security systems?	___	___	
h. Leachate collection system?	___	___	
i. Gas collection system?	___	___	
j. Other (specify)?	___	___	
5. Does the plan describe the frequencies for each type of maintenance activity (265.112a.1)?	___	___	
6. Does the plan describe when the facility will be partially closed (265.112a.1)?	___	___	
7. Does the schedule for partial closure include: (265.112a.1)			
a. Date(s) of partial closure(s)?	___	___	
b. Total time required for each partial closure?	___	___	
c. Time required for intervening partial closure activities? (e.g., time required for waste removal, stabilization, treatment, disposal; placement of cover; vegetation; decontamination; certification.)	___	___	

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INSPECTOR J.D., DS.

VIII. Closure and Post-Closure: - Continued
(Part 265 Subpart G)

	Yes	No	Comments
(F) Post-Closure:			The facility is attempting to Clean Close, if they ~~dont Succeed in they~~ they will submit a post Closure Plan.
1. Does the facility have a post-closure plan (265.118a)?	___	___	
2. Does the plan cover the maximum area expected to contain H.W. after closure, including: (265.118a)			
a. Landfills?	___	___	___
b. Disposal surface impoundments?	___	___	___
c. Land treatment facilities where H.W. will remain?	___	___	___
d. Other remaining H.W. (specify)?			
3. Does the plan cover all areas where H.W. will remain that were active as of Nov. 19, 1980 (265.118a)?	___	___	___
4. Does the plan provide for 30 years of post-closure care (265.117a)?	___	___	___
5. Does the plan clearly identify the activities required in post-closure care (265.118a)?	___	___	___
6. Does the plan clearly identify the frequencies for post-closure care activities (265.118a)?	___	___	___
7. Does the plan describe ground-water monitoring, including: (265.118a.1)			
a. Number of wells?	___	___	___
b. Sample collection activities and frequencies?	___	___	___
c. Sample testing procedures and frequencies?	___	___	___
d. Replacement of failed wells?	___	___	___

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INSPECTOR JD, DS

VIII. Closure and Post-Closure: - Continued
(Part 265 Subpart G)

	Yes	No	Comments
8. Does the plan describe maintenance for waste containment structures, including the types of activities and frequency of activities necessary to maintain: (265.118a.2)			
a. Site security systems?	___	___	___
b. Surveyed benchmarks?	___	___	___
c. Facility monitoring systems?	___	___	___
d. Final cover (erosion damage repair)?	___	___	___
e. Vegetation (fertilizing and mowing)?	___	___	___
f. Runoff collection and treatment systems?	___	___	___
g. Runon control systems?	___	___	___
h. Leachate collection, removal and treatment systems?	___	___	___
i. Gas collection and treatment systems?	___	___	___
j. Other (specify)?	___	___	___
9. Does the plan identify the name, address and phone number of the post-closure period contact (265.118a.3)?	___	___	___
10. Did the facility amend the plan whenever changes in operating practices, or process design, or events which occur during the active life of the facility, affect their post-closure plan (265.118b)? (Plan must be amended within 60 days after the changes or events occur.)	___	___	___
11. Did the facility submit their post-closure plan to the RA at least 180 days before they expect to begin closure (265.118c)?	___	___	___
12. Did the facility amend the plan whenever changes in monitoring or maintenance plans or events which occur during the post-closure care period affect their post-closure plan (265.118e)? (Facility must petition RA to amend plan in accordance with procedures specified in § 265.118f.)	___	___	___

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INSPECTOR J.D. DS

VIII. Closure and Post-Closure: - Continued
(Part 265 Subpart G)

	Yes	No	Comments
(G) Notice To Local Land Authority:			
1. For disposal facilities, were the following documents submitted to the RA and local land authority within 90 days after closure was completed: (265.119)			
a. A survey plat indicating the locations and dimensions of landfill cells or other disposal areas with respect to permanently surveyed benchmarks?			
b. A record of the type, location, and quantity of H.W. disposed of within each cell or area of the facility?			
c. A record of the type, location, and quantity of the wastes disposed of before Nov. 19, 1980?			
(H) Notice In Deed To Property:			
1. For disposal facilities, did the owner of the property record in the deed a notation that will in perpetuity notify any potential purchaser of the property that the land was used to manage H.W. and its use is restricted under § 265.117c (265.120)?			

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INSPECTOR: JD, DS

IX. Financial Requirements:
(Part 265 Subpart H)

	Yes	No	Comments
(A) Cost Estimate For Closure:			
1. Has a written estimate been prepared of the cost of closing the facility (265.142a)?	X		
What is the amount of the closure cost estimate?			$ 6,120,319
2. Does the estimate equal the cost of closure at the point when the extent and manner of the operation would make closure the most expensive (265.142a)?			
3. Does the cost estimate cover all the activities in the closure plan (265.142a)?			
4. Has the cost estimate been adjusted for inflation within 30 days after each anniversary of the date on which the first cost estimate was prepared (265.142b)?			
5. Was the adjustment made by using an inflation factor derived from the Annual Implicit Price Deflator for Gross National Product as published by the U.S. Dept. of Commerce in its "Survey of Current Business" (265.142b)?			

Latest Annual Deflator = ____________

Previous Annual Deflator = ____________

Inflation Factor = ____________ (latest deflator/previous deflator)

Current Cost Adjustment = $ ____________ (latest adjusted estimate x inflation factor)

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INSPECTOR J.D., D.S.

IX. Financial Requirements: - Continued
(Part 265 Subpart H)

	Yes	No	Comments
6. Was the cost estimate revised whenever a change in the closure plan increased the cost of closure (265.142c)? (Revised estimate must be adjusted for inflation.)	X		
7. Are the following kept at the facility during the operating life of the facility: (265.142d)			
a. Latest closure cost estimate?	X		
b. Latest adjusted closure cost estimate?	X		
8. Is there written documentation supporting the closure cost estimate?	X		
a. Workups from labor, material and equipment requirements?	X		
b. Contractor estimates and bids?			Done by PG&E Engineering
c. Figures derived from cost estimating handbooks?	X		
d. Figures derived from operator experience?	X		
9. Does the estimate accurately reflect the cost of closure for similar types of facilities?	X		

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IX. Financial Requirements: - Continued (Part 265 Subpart H) INSPECTOR JD, DS

	Yes	No	Comments
(B) Cost Estimate For Post-Closure Care:			Not evaluated but no problems anticipated
1. Has a written estimate been prepared of the annual cost of post-closure monitoring and maintenance of the facility (265.144a)?	___	___	
What is the amount of the post-closure cost estimate? $ NA			
2. Is the annual estimate multiplied by 30 to cover the entire post-closure care period (265.144a)?	___	___	The facility is trying to clean close
3. Does the cost estimate cover all activities in the post-closure plan (265.144a)?	___	___	
4. Has the cost estimate been adjusted for inflation within 30 days after each anniversary of the date on which the first cost estimate was prepared (265.144b)?	___	___	
5. Was the adjustment made by using an inflation factor derived from the annual Implicit Price Deflator for Gross National Product as published by the U.S. Dept. of Commerce in its "Survey of Current Business" (265.144b)?	___	___	

Latest Annual Deflator = ___________

Previous Annual Deflator = ___________

Inflation Factor = ___________ (Latest Deflator/Previous Deflator)

Annual Cost Adjustment = $ ___________ (Latest Adjusted Estimate x Inflation Factor)

Post-Closure Cost Estimate = $ ___________ (Annual Cost Adjustment x 30)

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INSPECTOR J.D., D.S.

IX. Financial Requirements: - Continued
(Part 265 Subpart H)

	Yes	No	Comments
6. Was the cost estimate revised whenever a change in the post-closure plan increased the cost of post-closure (265.144c)? (Revised estimate must be adjusted for inflation.)	___	___	The facility is trying to clean-close
7. Are the following kept at the facility during the operating life of the facility: (265.144d)			
a. Latest post-closure cost estimate?	___	___	___
b. Latest adjusted post-closure cost estimate?	___	___	___
8. Is there written documentation supporting the post-closure cost estimate?	___	___	___
a. Workups for labor, material and equipment requirements?	___	___	___
b. Contractor estimates and bids?	___	___	___
c. Figures derived from cost estimating handbooks?	___	___	___
d. Figures derived from operator experience?	___	___	___
9. Does the estimate accurately reflect the cost of post-closure for similar types of facilities?	___	___	___

X. Use And Management Of Containers:
(Part 265 Subpart I)

	Yes	No	Comments
1. Does the facility transfer H.W. from containers not in good condition or leaking to containers in good condition (265.171)?	X		
2. Are containers compatible with H.W. stored in them (265.172)?	X		
3. Are containers stored closed (265.173a)?	X		
4. Are containers managed to prevent rupture or leakage (265.173b)?	X		
5. Are containers inspected weekly for leaks and deterioration (265.174)?	X		
6. Are ignitable or reactive wastes stored at least 50 feet from the facility's property line (265.176)?	X		
7. Are incompatible wastes stored in separate containers (265.177a)?			N.A
8. Are H.W. not placed in unwashed containers that previously held an incompatible waste or material (265.177b)?			N.A
9. Are containers holding a H.W. that is incompatible with any waste or materials stored nearby in other containers, piles, open tanks, or surface impoundments separated from the incompatibles by suffecient distance or protected by means of a dike, ~~berm~~, wall, or other device (265.177c)?			N.A
10. Are containers that are not empty managed as a H.W. (261.7a.2)?	X		
11. For a container to be considered empty the facility must ensure that:			
a. No more than one inch of residue remains on bottom of container or inner lining (261.7b.1)?	X		
b. Containers that held an acutely H.W. are tripled rinsed using a solvent capable of removing the contents (261.7b.3)?	X		

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INSPECTOR JD, DS

XI. Tanks:
(Part 265 Subpart J)

	Yes	No	Comments
1. Is the treatment or storage of H.W. in tanks conducted so that it does not: (265.192a)			A 7000 gallon vertical above ground tank is used to store waste oil. The storage time does not exceed 90 days.
a. Generate extreme heat or pressure; fire or explosion; or violent reaction?	X		
b. Produce uncontrolled toxic or flammable mists, fumes, dusts, or gases?	X		
c. Damage the structural integrity of the tank?	X		
2. Are H.W. or treatment reagents placed in a tank so that they do not cause the tank or its inner liner to rupture, leak, corrode, or otherwise fail (265.192b)?	X		
3. Do uncovered tanks have at least 2 feet of freeboard, or dikes, or other containment features (265.192c)?			N/A. No uncovered tanks observed
4. Where H.W. is continuously fed into a tank, is the tank equipped with a waste feed cutoff system or by-pass system to a stand-by tank (265.192d)?			N/A
5. Does the facility conduct waste analysis and trial treatment or storage tests, or have they obtained written documentation on similar storage or treatment of similar waste under similar operating conditions before the tank is used to:			
a. Chemically treat or store a H.W. which is substantially different from waste previously treated or stored in the tank (265.193a.1)?			
b. Chemically treat H.W. with a substantially different process than was previously used (265.193a.2)?			

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INSPECTOR J.D.DS

XI. Tanks: - Continued
(Part 265 Subpart J)

	Yes	No	Comments
6. Are daily and weekly inspections done for the following:			
a. Discharge control equipment e.g., feed cutoff, bypass and drainage systems (Daily) (265.194a.1)?	✓		
b. Data gathered from monitoring equipment e.g., pressure and temperature gauges (Daily) (265.194a.2)?	✓		
c. Level of waste in uncovered tanks (Daily) (265.194a.3)?			N.A
d. Construction materials of tank e.g., corrosion, leaking fixtures or seams (Weekly) (265.194a.4)?	✓		
e. Discharge confinement structures e.g., dikes (Weekly) (265.194a.5)?	✓		
7. At closure, are all H.W. and residues removed from tanks and associated equipment and structures (265.197)?			N/A Not currently undergoing closure
8. Are ignitable or reactive waste treated, rendered, or mixed before or immediately after placement in a tank so that the resulting waste no longer meets the definition of ignitability or reactivity (265.198a.1)? or			N.A
9. Are ignitable or reactive waste stored or treated in such a way that it is protected from conditions which may cause the waste to ignite or react (265.198a.2)?			N.A.
10. Does the facility comply with the buffer zone requirements for covered tanks containing ignitable or reactive wastes specified in tables 2-1 through 2-6 of the National Fire Protection Association's "Flammable and Combustible Liquids Code" (1977 or 1981) (265.198b)?	✓		
11. Are incompatible wastes stored in separate tanks (265.199a)?			N.A only one tank for storing waste oil
12. Are H.W. not placed in unwashed tanks that previously held an incompatible waste or material (265.199b)?			✓

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INSPECTOR JD, DS

XII. Surface Impoundments:
(Part 265 Subpart K)

	Yes	No	Comments
1. Do impoundments have at least 2 feet of freeboard (265.222)?	X		
2. Do earthen dikes have protective cover to minimize wind and water erosion and to preserve their structural integrity (265.223)?	X		
3. Does the facility conduct waste analysis and trial treatment tests, or have they obtained written documentation on similar treatment of similar waste under similar opreating conditions before the impoundment is is used to:			N.A. - The facility has discontinued use of hexavalent chrome compounds in cooling tower water treatment since Oct '85 and since then they have been using phosphate based chemicals for the purpose
a. Chemically treat a H.W. which is substantially different from waste previously treated in the impoundment (265.225a.1)?	X		
b. Chemically treat H.W. with a substantially different process than was previously used (265.225a.2)?			N.A.
4. Is the treatment of H.W. in impoundments conducted so that it does not: (265.225a.2)			
a. Generate extreme heat or pressure; fire or explosion; or violent reaction?			
b. Produce uncontrolled toxic or flammable mists, fumes, dusts, or gases?			
c. Damage the structural integrity of the liner?			
d. Threaten human health or the environment?			
5. Is the freeboard level inspected at least daily (265.226a.1)?	X		
6. Are the dikes inspected weekly for evidence of leaks, deterioration or failure (265.226a.2)?	X		

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INSPECTOR J.D, DS

XII. Surface Impoundments: - Continued
(Part 265 Subpart K)

	Yes	No	Comments
7. At closure, has the facility removed from the impoundments: (265.228a)			Closure not implemented yet. Closure plan ~~approved by FPU~~
a. Standing liquids?			
b. Waste and waste residues?			
c. The liner, if any?			
d. Underlying and surrounding contaminated soil?			on oct. 20, 87
8. At closure, has the facility demonstrated under § 261.3 c & d that none of the materials listed in (7) remaining at any stage of removal are H.W. (265.228b)?			
9. If the answers to (7) & (8) are no, has the facility closed the impoundment and provided post-closure care as a landfill (265.228c)?			
10. Is an ignitable or reactive waste treated, or mixed before or immediately after placement in an impoundment so that the resulting waste no longer meets the definition of ignitability or reactivity (265.229a.1)?			N.A.
11. Does the facility take precautions to ensure that incompatible wastes and materials are not placed in the same impoundment (265.230)?			N.A

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INSPECTOR J.D.D.

XIII. Waste Piles:
(Part 265 Subpart L)

	Yes	No	Comments
1. Are waste piles covered or protected from dispersal by wind (265.251)?			N.A. No waste piles
2. Is a representative sample of waste from each incoming movement analyzed to determine its compatibility with other waste in the pile (265.252)?			
3. For waste piles where the leachate or run-off from the pile is a H.W.:			
a. Is the pile placed on an impermeable base that is compatible with the waste; run-on is diverted away from the pile; leachate and run-off is collected and managed as a H.W. (265.253a)? -or-			
b. The pile is protected from precipitation and run-on (265.253b.1)? -and-			
c. No liquids or wastes containing free liquids are placed in the pile (265.253b.2)?			
4. For facilities that add ignitable or reactive wastes to an existing pile, can the following be demonstrated:			
a. The resulting waste mixture no longer meets the definition of ignitable or reactive waste and the mixing will not cause an uncontrolled reaction (265.256a.1)?			
b. The waste is protected from materials or conditions that might cause them to ignite or react (265.256a.2)?			
5. Does the facility take precautions to ensure that incompatible wastes and materials are not placed in the same waste pile (265.257a)?			
6. Are piles of H.W. that are incompatible with materials storec nearby separated by suffecient distance or protected by some structural device e.g., dike, wall or berm (265.257b)?			
7. Are H.W. not placed on the same area where incompatible wastes were previously piled (265.257c)?			

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INSPECTOR JD, DS

XIV. Land Treatment:
(Part 265 Subpart M)

	Yes	No	Comments
(A) General Operating Requirements:			
1. Is treated H.W. capable of biological or chemical degradation (265.272a)?	___	___	N.A. No land Treatment
List H.W. placed in land treatment unit.			
2. Is run-on control system designed, constructed, operated, and maintained to keep flow off the active portions of the facility during peak discharge from at least a 25-year storm (265.272b)?	___	___	
3. Is run-off management system designed, constructed, operated, and maintained to collect and control water volume at least equivalent to a 24-hour, 25-year storm (265.272c)?	___	___	
4. Are collection and holding facilities associated with run-on and run-off control systems managed to maintain design capacity of system (265.272d)?	___	___	
5. Is the treatment zone managed to control wind dispersal (265.272e)?	___	___	
(B) Waste Analysis:			
1. Before placing H.W. in or on a land treatment unit, has the facility determined the following:			
a. Concentrations in the waste of any substance that cause a waste to exhibit the EP toxicity characteristic (265.273a)?	___	___	
b. For any waste listed in Part 261, Subpart D, the concentration of any substance which caused the waste to be listed as a H.W. (265.273b)?	___	___	
c. If food chain crops are grown, the concentrations in the waste of As, Cd, Pb, & Hg, unless written, documented data shows that the constituent is not present (265.273c)?	___	___	

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	Yes	No	Comments
(C) Unsaturated Zone Monitoring:			
1. Does the facility have an unsaturated zone monitoring plan (265.278a)?			N.A.
2. Has the facility implemented the plan (265.278a)?			
3. Is the plan designed to detect vertical migration of H.W. and H.W constituents under active portions of the land treatment unit (265.278a.1)?			
4. Is the plan designed to provide information on the background concentrations of H.W. and H.W. constituents in similar but untreated soils nearby (265.278a.2)?			
5. Is background monitoring conducted before or in conjunction with monitoring required in 265.278a.1 (265.278a.2)?			
6. Does the plan include, at a minimum:			
a. Soil-monitoring using soil cores (265.278b.1)?			
b. Soil-pore water monitoring using devices such as lysimeters (265.278b.2)?			
7. Has the facility demonstrated the following in their plan:			
a. The depth at which soil and soil-pore water samples are to be taken is below the depth to which the waste is incorportated into the soil (265.278c.1)?			
b. The number of soil and soil-pore water samples to be taken is based on the variability of the H.W. constituents in the waste and the soil type(s) (265.278c.2)?			
c. The frequency and timing of soil and soil-pore water sampling is based on the frequency, time, and rate of waste application, proximity to ground-water, and soil permeability (265.278c.3)?			

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INSPECTOR J.D. DC

XIV. Land Treatment: - Continued
(Part 265 Subpart M)

	Yes	No	Comments
8. Is the plan and the rationale used in developing this plan kept at the facility (265.278d)?	___	___	N.A.
9. Does the facility analyze the soil and soil-pore water samples for the H.W. constituents that were found in the waste during the waste analysis (265.278e)?	___	___	
(D) Recordkeeping:			
1. Are records kept regarding application dates and rates, quantities, and locations of all H.W. placed in the land treatment unit (265.279)?	___	___	
(E) Closure and Post-Closure:			
1. Does the closure plan and post-closure plan address the following objectives and indicate how they will be achieved:			
a. Control of migration of H.W. and H.W. constituents from the treatment zone into the ground-water (265.280a.1)?	___	___	
b. Control of the release of contaminated run-off from the unit into surface water (265.280a.2)?	___	___	
c. Control of the release of airborne particulate contaminants caused by wind erosion (265.280a.3)?	___	___	
d. Compliance with 265.276 (growth of food chain crops) (265.280a.4)?	___	___	
2. Were the following factors considered in addressing the closure and post-closure care objectives:			
a. Type and amount of H.W. and H.W. constituents applied to the land treatment unit (265.280b.1)?	___	___	
b. Mobility and expected rate of migration of H.W. and H.W. constituents (265.280b.2)?	___	___	

XIV. Land Treatment: - Continued
(Part 265 Subpart M)

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	Yes	No	Comments
c. Site location, topography, and surrounding land use with respect to the potential effects of pollutant migration (e.g., proximity to ground water, surface water and drinking water sources) (265.280b.3)?	___	___	N.A
d. Climate, including amount, frequency & pH of precipitation (265.280b.4)?	___	___	___
e. Geological and soil profiles; surface & subsurface hydrology of the site; soil characteristics, including cation exchange capacity, total organic carbon, and pH (265.280b.5)?	___	___	___
f. Unsaturated zone monitoring information (265.280b.6)?	___	___	___
g. Type, concentration, and depth of migration of H.W. constituents in the soil as compared to their background concentrations (265.280b.7)?	___	___	___
3. Were the following methods considered in addressing the closure and post-closure care objectives:			
a. Removal of contaminated soil (265.280c.1)?	___	___	___
b. Placement of final cover, considering: (265.280c.2)			
Functions of cover (e.g., infiltration control, erosion and run-off control, and wind erosion control?	___	___	___
Characteristics of the cover, including material, final surface contours, thickness, porosity and permeability, slope, length of run of slope and type of vegetation on the cover?	___	___	___
4. Does the closure plan provide for the following during the closure period:			
a. Continuation of the unsaturated zone monitoring program (soil-pore liquid monitoring may be terminated 90 days after last application of waste (265.280d.1)?	___	___	___

XIV. Land Treatment: - Continued
(Part 265 Subpart M)

	Yes	No	Comments
b. Maintenance of run-on control system (265.280d.2)?	___	___	N.A.
c. Maintenance of run-off management system (265.280d.3)?	___	___	
d. Controlling wind dispersal of H.W. (265.280d.4)?	___	___	
e. Closure certification by both owner or operator and an independent qualified soil scientist (265.280e)?	___	___	
5. Does the post-closure plan provide for the following during the post-closure care period:			
a. Continuation of the soil-core monitoring program (265.280f.1)?	___	___	
b. Restriction of access to the unit as appropriate (265.280f.2)?	___	___	
c. Assurance of compliance with 265.276 (food chain crops) (265.280f.3)?	___	___	
d. Controlling wind dispersal of H.W. (265.280f.4)?	___	___	
(F) Requirements For Ignitable Or Reactive Waste:			
1. Are ignitable or reactive wastes immediately incorporated into the soil so that either:			
a. The resulting waste mixture no longer meets the definition of ignitable or reactive waste (265.281a.1); and Section 265.17b is complied with (265.281a.2)? or	___	___	
b. The waste is managed in such a way that it is protected from conditions which may cause it to ignite or react (265.281b)?	___	___	
(G) Requirements For Incompatible Wastes:			
1. Does the facility ensure that incompatible wastes are not placed in the same unit (265.282)?	___	___	

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INSPECTOR JD, DS

XV. Landfills:
(Part 265 Subpart N)

	Yes	No	Comments
(A) General Operating Requirements:			N.A
1. Is the run-on control system capable of preventing flow onto active portions during peak discharge from a 25-year storm (265.302a)?	___	___	___
2. Is the run-off management system capable of collecting and controlling the water volume resulting from a 24-hour, 25-year storm (265.302b)?	___	___	___
3. After storms are the run-on and run-off control systems returned to their design capacities (265.302c)?	___	___	___
4. Are H.W. managed to prevent wind dispersal (265.302d)?	___	___	___
B) Surveying And Recordkeeping:			
1. Does the facility maintain the following items in the operating record:			
a. On a map, the exact location, dimensions and depth of each cell with respect to permanently surveyed benchmarks (265.309a)?	___	___	___
b. The contents of each cell and the location of each H.W. type within each cell (265.309b)?	___	___	___
(C) Closure and Post-Closure:			
1. Has a final cover been placed over the landfill and does the closure plan specify the function and design of the final cover (265.310a)?	___	___	___

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XV. Landfills: - Continued
(Part 265 Subpart N)

	Yes	No	Comments
2. Does the closure and post-closure plans address the following objectives and indicate how they will be achieved: (265.310b)			N.A.
a. Control of pollutant migration from the facility via ground-water, surface water, and air (265.310b.1)?			
b. Control of surface water infiltration including prevention of pooling (265.310b.2)?			
c. Prevention of erosion (265.310b.3)?			
3. Are the following factors addressed with respect to the objectives stated in § 265.310b:			
a. Type and amount of H.W. and H.W. constituents in the landfill (265.310c.1)?			
b. The mobility and expected rate of migration of H.W. and H.W. constituents (265.310c.2)?			
c. Site location, topography, and surrounding land use, with respect to the potential effects of pollutant migration (e.g., proximity to ground-water, surface water, and drinking water sources.)(265.310c.3)?			
d. Climate, including amount, frequency, and pH of precipitation (265.310c.4)?			
e. Characteristics of the cover including type of material, source, final surface contours, thickness, porosity, permeability, slope, lenght of run of slope, and type of vegetation on the cover (265.310c.5)?			
f. Geological and soil profiles and surface and subsurface hydrology of the site (265.310c.6)?			

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XV. Landfills: - Continued
(Part 265 Subpart N)

	Yes	No	Comments
4. During the post-closure care period does the facility:			N.A.
a. Maintain the function and integrity of the final cover (265.310d.1)?	___	___	___
b. Maintain and monitor the leachate collection, removal, and treatment system to prevent excess accumulation of leachate in the system (265.310d.2)?	___	___	___
c. Maintain and monitor the gas collection system to control the vertical and horizontal escape of gases (265.310d.3)?	___	___	___
d. Protect and maintain surveyed benchmarks (265.310d.4)?	___	___	___
e. Restrict access to the landfill (265.310d.5)?	___	___	___
(D) Requirements For Ignitable Or Reactive Wastes:			
1. Are ignitable or reactive wastes treated, rendered, or mixed before or immediately after placement in the landfill so that the resulting waste mixture does not:			
a. Exhibit the characteristics of ignitability or reactivity (265.312a.1)?	___	___	___
b. Generate extreme heat or pressure, fire or explosion, or violent reaction; produce uncontrolled toxic or flammable air emissions; damage the liner; threaten human health and the environment (265.312a.2)?	___	___	___

XV. Landfills: - Continued
(Part 265 Subpart N)

	Yes	No	Comments
(E) Requirements For Ignitable Wastes Disposed Of In Containers: (265.312b)			N.A.
1. Are wastes protected from materials or conditions which may cause them to ignite?	___	___	___
2. Are wastes disposed of in non-leaking containers?	___	___	___
3. Are wastes carefully handled and placed so as to avoid heat or sparks?	___	___	___
4. Are wastes covered daily with soil?	___	___	___
5. Are wastes disposed in cells that do not contain other wastes which may generate heat and cause ignition?	___	___	___
(F) Requirements For Incompatible Wastes:			
1. Are incompatible wastes and materials not placed in the same landfill cell (265.313)?	___	___	___
(G) Requirements For Liquid Wastes:			
1. For facilities that accept bulk liquid waste or waste containing free liquids, are the following requirements met:			
a. The landfill has a liner and leachate collection and removal system as specified in § 264.301a (265.314a.1)?	___	___	___
b. Before disposal, the liquids are treated or stabilized, chemically or physically, so that free liquids are no longer present (265.314a.2)?	___	___	___
2. For facilities that accept liquids in containers, are the following requirements met prior to disposal:			
a. All free-standing liquid is removed by decanting (265.314b.1)?	___	___	___

10-14-87

CA T0000 1729

INSPECTOR J.D., D.S.

XV. Landfills: - Continued
(Part 265 Subpart N)

	Yes	No	Comments
b. All free-standing liquid is eliminated by mixing with absorbent or solidification (265.3 4b.1)?			N.A
[containers that are very small (ampules); are designed to hold free liquids (batteries); or are lab packs are not subject to these restrictions]			
(H) Requirements For Containers:			
1. Are empty containers crushed flat, shredded, or similarly reduced in volume before they are buried in the landfill (265.315a)?			
(I) Requirements For Disposal Of Lab Packs In Overpacked Drums:			
1. Do lab packs placed in the landfill meet the following requirements: (265.316)			
a. Lab packs are non-leaking?			
b. Lab packs are compatible with waste?			
c. Lab packs are securely sealed?			
d. Lab packs comply with DOT specs?			
e. Lab packs are overpacked in open head DOT spec drum 110 G or less?			
f. Suffecient quantity of aborbent material has been placed in drum to completely absorb all liquid contents of lab packs?			
g. Drum is full after packing with lab packs and absorbent?			
h. Absorbent material is compatible with waste?			
i. Incompatible wastes are not placed in same drum?			
j. Reactive wastes, other than cyanide- or sulfide-bearing wastes are treated or rendered non-reactive prior to placement in lab packs?			

10-14-87

Inspection Checklist for HSWA Requirements

CA 10000:1729

INSPECTOR J.D., DS

Loss of Interim Status (§270.73)

	YES	NO	COMMENTS
1. Does the facility have any RCRA units that were subject to the loss of Interim Status provision of HSWA? (MAJOR FACILITIES)	___	___	N.A.
2. Did any of the affected RCRA units lose Interim Status on 11/8/85?	___	___	___
3. If so, are any of those units still accepting RCRA hazardous waste?	___	___	___
4. Which ones?			___
5. If the facility has ceased accepting hazardous waste, what was the last date on which RCRA hazardous waste was placed in such unit(s)?			___
6. Are any of the RCRA units now accepting waste that is non-hazardous or regulated only by the State?	___	___	___

First Rough Draft

Batson

LIT 10-14-87
1:SC-101
CA T080011729
INSPECTOR Joseph Desay
David Schmidt

GENERATOR CHECKLIST

Date Oct. 14, 1987

Headquarters

EPA No. CAT 080011729

Generator Name P G and E Topock compressor station

14 miles south east of Needles on I-40, Needles, S.B. 92363
Street Address City County ZIP Code

County Code No. 36

Person(s) Present James Soden, Rex Avila

(619) 326-2615
(Area Code) Phone No.

(619) 326-2615
(Area Code) Phone No.

Ownership

	Last Name	First Name	Position
1.	Pacific Gas & Electric		
2.			
3.			
4.			

Parent Company (~~AKAs~~/DBAs)

1. P G & E
2.
3.
4.

First Rough Draft

ITSC-101
DATE 10-14-87

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INSPECTOR I.D., DS

In Compliance?

General Requirements

Yes	No	N/A	?	
1. X				Generator shall determine if waste generated is hazardous. (Section 66471, California Administrative Code (CAC).)
2. X				Generator shall apply for and receive an Enviromental Protection Agency identification number (EPA ID No.) and shall not treat, store or dispose of, transport or offer for transportation hazardous waste without having an EPA ID No. (Sections 66472 (a) and (d), CAC.)
3. X				Generator shall not offer hazardous waste to transporters or to treatment, storage, and disposal (TSD) facilities that do not have an EPA ID No. (Section 66472 (c), CAC.)
4. X				Generator may accumulate hazardous waste on site for 90 days or less provided that:

a. Waste is in containers and generator complies with Article 24 (Container Use/Management), or waste is in tanks and generator complies with Article 25 (Tank Management). (Section 66508 (a) (1), CAC.)

b. Date each period of accumulation begins is clearly marked and visible for inspection on each container. (Section 66508 (a) (2), CAC.)

c. Each container/tank labeled/marked clearly with "Hazardous Waste" and additional labeling requirements of Section 66508 (c), CAC (see No. 6 below). (Section 66508 (a) (3), CAC.)

d. Generator complies with Articles 19 (Preparedness and Prevention) and 20 (Contingency Plan and Emergency Procedures), and Section 67105 (Personnel Training). (Section 66508 (a) (4), CAC.)

Yes	No	N/A	?	
5. X				If generator accumulates hazardous waste for more than 90 days, he is subject to Articles 17 through 32 as a storage facility unless he has been granted an extension by the Department. (Section 66508 (b), CAC.)

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INSPECTOR J.D., DS

in Compliance?

Yes	No	N/A	?		
6. X					All nonstationary containers of hazardous wastes shall be labeled with the following information:

a. Composition and physical state of waste. (Section 66508 (c) (1), CAC.)

b. Statement(s) calling attention to hazardous properties of the waste. (Section 66508 (c) (2), CAC.)

c. Name and address of waste producer. (Section 66508 (c) (3), CAC.)

Yes	No	N/A	?		
7. X					Generator shall prepare and submit to the Department a Biennial Report by March 1 of each even-numbered year, which covers generator activities during the previous calendar year and includes the following information:

a. Generator's EPA ID No., name, and address. (Section 66493 (a) (1), CAC.)

b. Calendar years covered by report. (Section 66493 (a) (2), CAC.)

c. EPA ID No., name, and address for each off-site TSD facility and/or foreign facility to which waste was shipped. (Section 66493 (a) (3), CAC.)

d. Each transporter's name and EPA ID No. (Section 66493 (a) (4), CAC.)

e. Description, California hazardous waste category number, Department of Transportation (DOT) hazard class, and quantity of each waste shipped. (Section 66493 (a) (5), CAC.)

f. Certification signed by generator/authorized representative. (Section 66493 (a) (6), CAC.)

Yes	No	N/A	?		
8. X					Generator shall retain a copy of each Biennial Report and Exception Report for at least three years. (Section 66492 (b), CAC.)
9. X					Generator shall retain records of any test results, waste analyses, or other determinations for at least three years. (Section 66492 (c), CAC.)

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INSPECTOR J.D., DS

Manifest Requirements

in compliance?

	Yes	No	N/A		
1.	X				Generator prepares a manifest prior to transporting waste off site. (Section 66480 (a), CAC.)
2.	X				Generator designates on manifest one facility and, if desired, one alternate facility. (Sections 66480 (b) and (c), CAC.)
3.	X				All applicable sections of each manifest shall be accurately, completely, and legibly filled out. (Section 66481 (b), CAC.)
4.	X				Manifest contains the required information:

a. Manifest document number. (Section 66482 (a) (1), CAC.)

b. Generator's name, mailing address, telephone number, and EPA ID No. (Section 66482 (a) (2), CAC.)

c. Name and EPA ID No. of transporter. (Section 66482 (a) (3), CAC.)

d. Name, address, and EPA ID No. of designated/alternate facility. (Section 66482 (a) (4), CAC.)

e. DOT description of waste. (Section 66482 (a) (5), CAC.)

f. Total quantity of waste, type, and number of containers. (Section 66482 (a) (6), CAC.)

	Yes	No	N/A		
5.	X				Generator completes the generator and waste section, signs the manifest certification, obtains the required signatures, and distributes copies as specified. (Sections 66484 (a) through (d), CAC.)
6.	X				Generator sends copies of manifest to the Department within 30 days of shipment of waste. (Sections 66484 (f) and 25160 (b), CAC.)
7.	X				Generator determines the status of waste if copy of manifest is not received 35 days after shipment. (Section 66484 (g), CAC.)
8.	X				Generator submits an Exception Report if copy of manifest is not received within 45 days of shipment. (Section 66484 (g), CAC.)

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INSPECTOR J.D., DS

In Compliance?

	Yes	No	N/A	?	
9.	X	_	_	_	Generator retains copies of manifests for at least three years. (Section 66492 (a), CAC.)
10.	X	_	_	_	Any person importing/exporting hazardous waste into/out of the State from/to a foreign country shall comply with manifesting and notification requirements. (Section 66535, CAC.)

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INSPECTOR J.D, D.S.

in Compliance?

Preparedness and Prevention

	Yes	No	N/A		
1.	X				All facilities shall have: a. An internal communication/alarm system; b. A two-way communication device for summoning emergency assistance; c. Fire control, spill control, and decontamination system; and d. Water at adequate volume and pressure for foam-producing equipment. (Section 67121, CAC.)
2.	X				All emergency systems and equipment shall be properly tested and maintained. (Section 67122, CAC.)
3.	X				All personnel handling hazardous wastes shall have immediate access to communications/alarms systems. (Section 67123, CAC.)
4.	X				Owner/operator shall maintain adequate aisle space to allow the unobstructed movement of personnel and equipment in an emergency. (Section 66124, CAC.)
5.	X				Owner/operator shall attempt to make arrangements with local emergency response agencies to familiarize them with the facility layout/operations and the nature of potential hazards/injuries; any refusal by State/local authorities to enter into any agreements shall be documented by owner/operator. (Section 67126, CAC.)

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INSPECTOR JD, DS

Training

In Compliance?

	Yes	No	N/A	?	
1.	X				Facility personnel shall sucessfully complete a program of classroom instruction/on-the-job training directed by a person trained in hazardous waste management procedures; program shall be designed to ensure that facility personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, equipment, and systems. (Section 67105 (a), CAC.)
2.	X				Facility personnel shall complete training program six months after employment/assignment date and shall not work in unsupervised positions without completing training. (Section 67105 (b), CAC.)
3.	X				Facility personnel shall take part in an annual review of training. (Section 67105 (c), CAC.)
4.	X				Facility owner/operator shall maintain the following documents/records at facility:
5.	X				Training records shall be maintained until closure of facility (for current employees) or for at least three years (for former employees). (Section 67105 (e), CAC.)

Item 4 documents/records:

a. The job title and name of employee for each position related to hazardous waste management;

b. A written description of each position;

c. A written training plan for each position; and

d. Records documenting that training requirements have been met. (Section 67105 (d), CAC.)

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In Compliance? Contingency Plan/Emergency Procedures

	Yes	No	N/A	?	
1.	X				Each owner/operator has a contingency plan. (Section 67104 (a), CAC.)
2.	X				The contingency plan describes the actions facility personnel must take in response to emergencies. (Section 67141 (a), CAC.)
3.	X				The plan descibes arrangements with local agencies, hospitals, and contractors. (Section 67141 (c), CAC.)
4.	X				The plan lists names, addresses, and phone numbers of emergency coordinators. (Section 67141 (d), CAC.)
5.	X				The plan includes a list of all emergency equipment including the locations, description, and capabilities of each item. (Section 67141 (e), CAC.)
6.	X				The plan contains evacuation procedures and routes. (Section 67141 (f), CAC.)
7.	X				Copies of the contingency plan are maintained at the facility and distributed to local emergency response agencies. (Section 67142, CAC.)
8.	X				The emergency coordinator is thoroughly familiar with the facility, it's operation plan, and contingency plan, and has the authority to commit the resources needed to carry out the contingency plan. (Section 67144, CAC.)

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INSPECTOR JD, DS

Containers

in Compliance?

	Yes	No	N/A	?	
1.	X				The owner/operator uses a container that is compatible with the waste to be stored. (Section 67242, CAC.)
2.	X				The owner/operator inspects container storage areas at least weekly. (Section 67244, CAC.)
3.			X		Incompatible wastes are not placed in the same containers. (Section 67243 (a), CAC.)
4.	X				Hazardous waste is not placed in an unwashed container that previously held an incompatible waste or material. (Section 67242 (b), CAC.)

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INSPECTOR JP, DS

Tank

in Compliance?

Yes	No	N/A		
1.		X		Hazardous wastes or treatment reagents are not placed in a tank if they could shorten the intended service life of the tank. (Section 67257 (b), CAC.)
2.		X		The owner/operator inspects daily the discharge control equipment, monitoring data, and the level of waste in each tank. (Sections 67259 (a) (1), (2), and (3), CAC.)
3. X				The owner/operator inspects, at least weekly, tank and discharge confinement, structure constructions, and materials. (Sections 67259 (a) (4) and (5), CAC.)
4.		X		Ignitable or reactive wastes are not placed in a tank unless precautions are taken to prevent reactions. (Section 67261 (a), CAC.)
5.		X		Incompatible wastes are not placed in the same tanks. (Section 67262 (a), CAC.)
6. X				Hazardous waste is not placed in an unwashed tank that previously contained an incompatible waste or material. (Section 67262 (b), CAC.)

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INSPECTOR J.P. DS

In Compliance?

Inspection Tour

Yes	No	N/A	?	
1. X				The generator packages, labels, placards, and masks each package in accordance with Title 49, Code of Federal Regulations, Sections 172, 173, 178, and 179, before transporting hazardous waste or offering hazardous waste for transportation off site. (Section 66504, CAC.)
2. X				The generator may accumulate hazardous waste on site for 90 days or less provided that: a. Each container is marked with the start of the accumulation date (Section 66508 (a) (2), CAC); b. Each container and tank is labeled "Hazardous Waste" (Section 66508 (a) (3), CAC); and c. Each nonstationary container is labeled with the composition and physical state, a statement or statements identifying the particular hazardous properties, and the name and address of the generator. (Section 66508 (c), CAC.)
3. X				The owner/operator maintains adequate aisle space. (Section 67124, CAC.)
4. X				The owner/operator transfers waste from a container that is in poor condition or leaking to one that is in good condition. (Section 67241, CAC.)
5. X				Each container is closed during storage and managed so as not to rupture or leak. (Section 67243, CAC.)
6. X				Containers holding ignitable or reactive wastes are located at least 15 meters from the facility's property line. (Section 67246, CAC).
7. X				Each container holding waste is separated from other incompatible wastes or materials. (Section 67247 (c), CAC.)
8. X				Uncovered tanks are operated to maintain 60 centimeters of freeboard or are provided with an alternate containment structure. (Section 67257 (c), CAC.)

in Compliance?

	Yes	No	N/A	?	
9.	__	__	X	__	Continuously fed tanks shall be equipped with a waste feed cutoff or bypass system. (Section 67257 (d), CAC.)
10.	__	__	X	__	Covered tanks used to treat or store ignitable or reactive wastes comply with the buffer zone requirements of the NFPA "Flammable and Combustible Liquids Codes". (Section 67261 (b), CAC.)

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S P E C I A L   J O B S

DATE: 1-9-91   FIELD REP: JD212   CAMERA # R12

LOCATION: Long Beach   FILM ROLL ID: ____   BOX ID: ____

DESCRIPTION: REC   # OF SETS: ____

SPECIAL INSTRUCTIONS:

!!!! PRINT CLEARLY !!!!

FILE 1 = NEEDLES 5 miles EAST OF NEEDLES OFF I-40
PG & E TOPOCK = ~~[illegible]~~ 272

FILE 2 = NEEDLES 5 MILES EAST OF NEEDLES OFF I-40
PG & E TOPCOK =

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S P E C I A L   J O B S

DATE: 1-9-91   FIELD REP: JD212   CAMERA # R 12

LOCATION: Long Beach   FILM ROLL ID: ______   BOX ID: ______

DESCRIPTION: REC ______   # OF SETS: ______

SPECIAL INSTRUCTIONS:

!!!! P R I N T   C L E A R L Y !!!!

FILE 1 = NEEDLES 5 miles EAST OF NEEDLES OFF I-40

PG & E TOPOCK = ~~[illegible]~~ 272

FILE 2 = NEEDLES 15 miles SOUTH EAST OF NEEDLES

TOPOCK GAS COMPRESSOR STATION =

[illegible]

TO

✓ Albert A.
✓ Sazedur R.
John S.
Christi C.
Tony C.
Alice G.
Waes I.
Liz L.
Joann O.
Karen T.
✓ Larry V. 6/30

FROM

Ric Notini

DATE: 6/27

✓ Take Appropriate Action
Initial & Circulate
For Information Only
Let's Discuss
File

DUE DATE

MESSAGE/REMARKS PLEASE HANDLE THIS AS A WITHIN AND PERFORM A PA/SI.

additional information is necessary for a PA/SI

I phoned Susan Chaevsky for recent lab results. 10-3-88

ATTACHMENT 2

STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF HEALTH SERVICES
714/744 P STREET
SACRAMENTO, CA 95814

Preliminary Assessment Summary

CAT080011729
PG & E Topock Compressor Station
15 miles east of Needles, off Interstate 40
Section 8, T7N, R23E, SBB & M

Prepare: Erich Linse/Kathryn Barwick
Toxic Substances Control Division
Southern California Section

Problem and History:

Pacific Gas and Electric Company has been operating this facility since 1951. From 1951 until 1969, untreated cooling tower wastewater (containing chromium) was discharged to a percolation bed just west of the compressor plant, in the vicinity of Bat Cave Wash. PG & E estimates that approximately six million gallons of wastewater were disposed of each year (between 1951 and 1969) in this fashion. PG & E also estimates that the total chromium concentration, including hexavalent chromium, in the cooling tower wastewater was 10ppm.

In 1969, PG & E began treating their wastewater using a two-step process. First, the waste water was treated using sulfur dioxide (SO_2) to reduce any hexavalent chromium to trivalent chromium. Second, the trivalent chromium was removed by precipitation, upon mixing with sodium hydroxide (NaOH). From 1969 to 1970, this treated wastewater was also discharged to the percolation bed.

From 1970 to 1974, Poly Floc II and ferric sulfate were also used to remove chromium from the wastewater. The waste liquid was then pumped into an underground injection well. No information was provided by PG & E concerning solids disposal during this time period. The injection well was not regulated by any agency. The injection well was closed and capped in 1974.

From 1974 until the present, treated wastewater has been pumped to four PVC-lined evaporation ponds. (After 1975, the use of Poly Floc II and ferric sulfate was discontinued in the treatment process.) Sludge from the ponds was hauled by truck to the City of Needles landfill; that practice was disallowed by the state Department of Health Services (DHS) in 1984. The sludge is now taken to a Class I disposal site.

Recommendation

Staff recommends active status, high priority. According to PG & E estimates, approximately one hundred and eight million gallons of chromium-containing wastewater were disposed of to a percolation bed, during an 18 year period (1951 to 1969). A study should be undertaken to determine whether groundwater contamination has occurred.

Let's discuss

To: Sayedur

From: Larry.

Topock compressor station (Bat cave wash)

Current laboratory data shows Cr(VI) levels above background but far below TTLC or STLC levels. Apparently the 20yrs that have passed since the chrome ponds have been used at this facility has been enough time to reduce the amount of Cr(VI) found in the soil now to Cr(3). A work plan for sampling was approved for this site in August 1986. The same plan was followed for this investigation. A second investigation was undertaken because test interference problems occured during the first investigation, Sept 23, 1987.

It is my opinion that we file this site as a walk-in no further action and delegate to the local health agency for future inspections.

San Bernardino county Health, Herman Mikesell, No violations found.

BAT CAVE WASH SOIL INVESTIGATION

TOPOCK GAS COMPRESSOR STATION
PACIFIC GAS AND ELECTRIC COMPANY

BROWN AND CALDWELL
CONSULTING ENGINEERS

BAT CAVE WASH SOIL INVESTIGATION

TOPOCK GAS COMPRESSOR STATION
PACIFIC GAS AND ELECTRIC COMPANY

OCTOBER 1988

BROWN AND CALDWELL
PLEASANT HILL, CALIFORNIA

C

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CHAPTER 1

INTRODUCTION

This report describes the results of a soil investigation conducted in the Bat Cave Wash area of Pacific Gas and Electric Company's (PG&E) Topock Gas Compressor Station (Station). The investigation was conducted to satisfy a request by the California Department of Health Services (DHS) and the U.S. Environmental Protection Agency (EPA) for information concerning chromium levels in soil at Bat Cave Wash. The work described herein consisted of collecting and analyzing soil samples from within Bat Cave Wash to determine if elevated concentrations of chromium were present in the alluvial sediments.

Background

The Station is located approximately 15 miles southeast of Needles, California (Figure 1-1). Two cooling towers are used for cooling of natural gas which is compressed at the station and for cooling of lubricating oil used in the compressor engines. To prevent corrosion of the heat exchanger bundles and the cooling tower structures, a phosphate-based corrosion inhibitor is added to the cooling tower water. This method of corrosion prevention, which uses nonhazardous chemicals and generates nonhazardous wastes, has been in use at the station since October 1985. Prior to October 1985, a chromium-based corrosion inhibitor was added to the cooling tower water.

From 1951 to 1969, the cooling tower wastewater was discharged into a percolation bed located in Bat Cave Wash just west of the compressor station facilities (Figure 1-2). Since 1969, the cooling tower wastewater has been discharged into four lined evaporation ponds after being treated to remove the chromium.

Bat Cave Wash begins in the Chemehuevi Mountains located south of the Station. It trends north-south through the Station property and drains into the Colorado River approximately 3/4-mile north of the former percolation bed site. Upstream of the former percolation bed site, the wash is narrow with a steep channel slope where it is incised into metadiorite and gneiss bedrock. In the vicinity of the former percolation bed, the wash becomes much wider with steep banks and is incised into alluvial fan deposits and the Chemehuevi Formation. Those deposits are composed of unconsolidated silt, sand, and gravel. The wash is up to 70 feet wide with a slope of approximately 0.033 feet per foot in the vicinity of the former percolation bed, but flattens downstream toward the Colorado River.

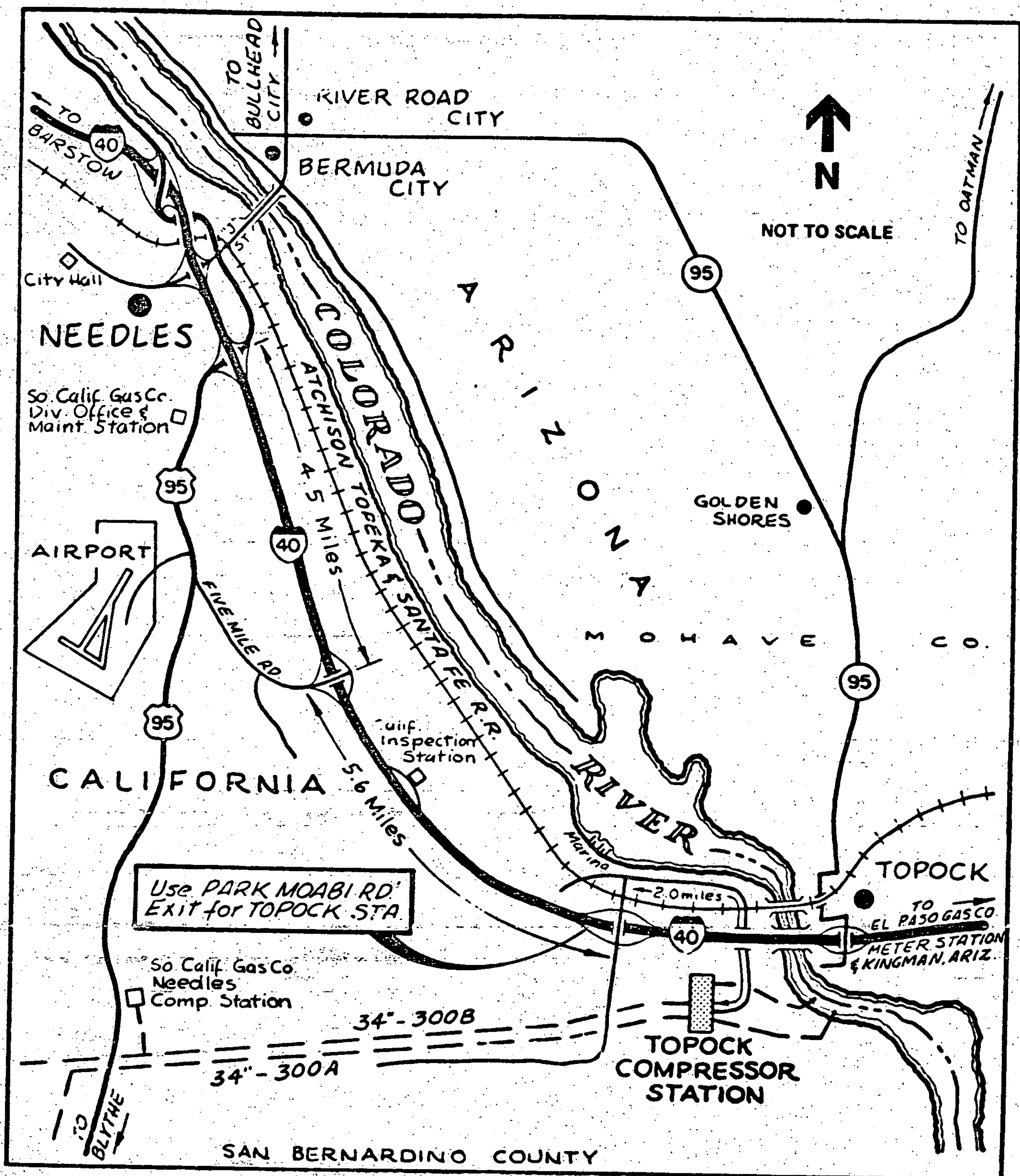

Figure 1-1 Vicinity Map

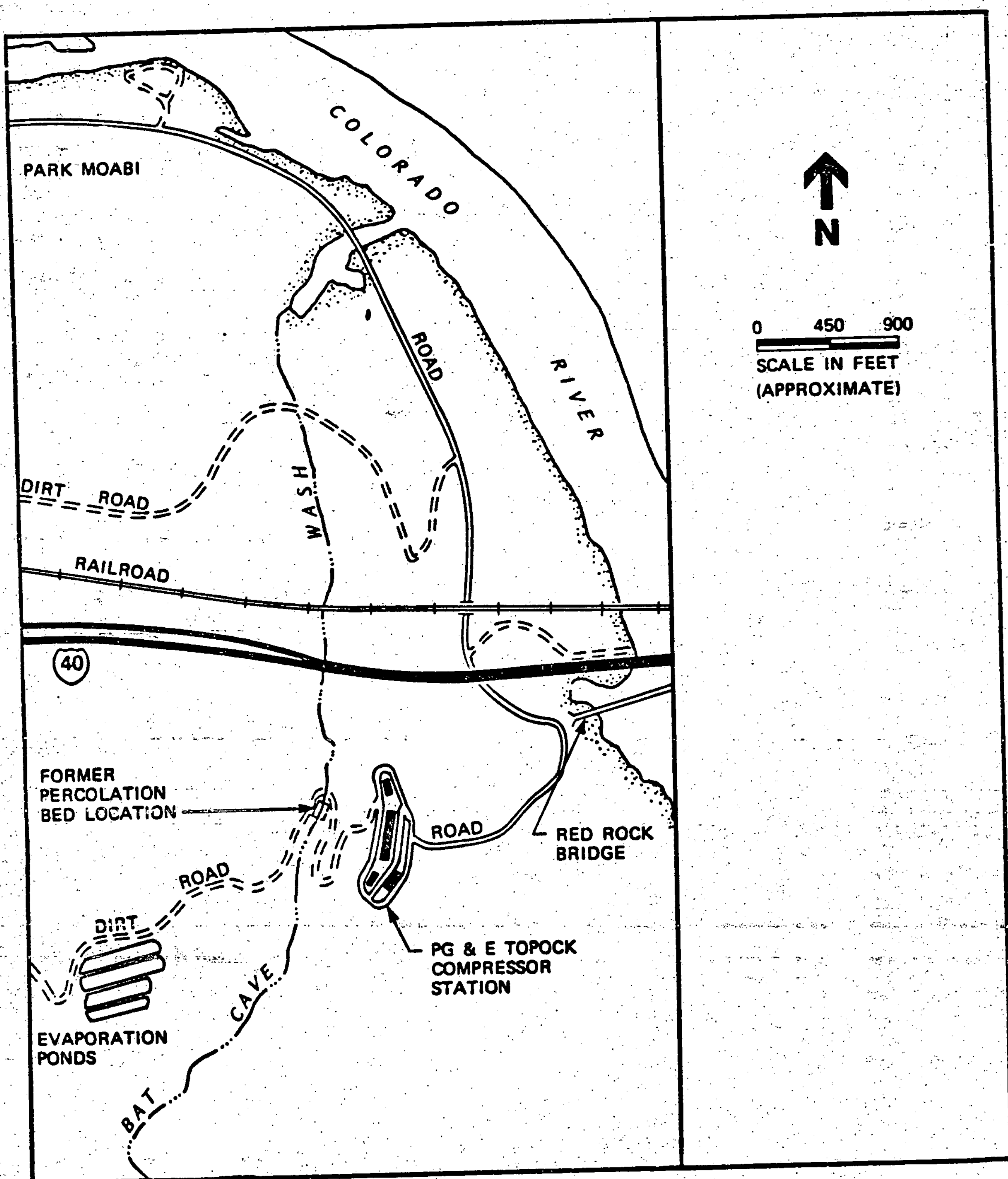

Figure 1-2 PG & E Topock Compressor Station Site Map

Average annual precipitation in the area is approximately 3 to 4 inches per year based upon weather records from a reporting station in Needles, California. Precipitation generally occurs in the form of thundershowers in the summer and fall or occasional rain and snowfall in the winter. Runoff from these infrequent seasonal storms is usually of short duration and the wash is dry throughout most of the year. Runoff can flow unimpeded down the wash until it reaches the Interstate 40 highway crossing and a railroad crossing located approximately 375 feet downstream of the former percolation bed. The interstate and railroad crossings are built upon constructed fill which blocks Bat Cave Wash and runoff is channelled through concrete culverts at both locations.

Description of Present Investigation

The purpose of this investigation was to define chromium concentrations in Bat Cave Wash soils within the former percolation bed and to determine if chromium has migrated downstream from the former percolation bed site. Identification of chromium concentrations in the soil would be accomplished by collecting a series of soil samples from within the area of the former percolation bed and from several locations downstream along Bat Cave Wash. Soil samples would also be obtained from a location upstream of the percolation bed to identify background chromium concentrations. A description of the proposed soil sampling and analysis plan is presented in Brown and Caldwell's August 1986 report "Sediment Sampling and Analysis Plan for Percolation Bed and Bat Cave Wash, Topock Gas Compressor Station". The sampling and analysis plan was reviewed by the California Department of Health Services prior to performance of the work described in this report.

Soil sampling was initially conducted at the site on September 23, 1987. However, due to colorimetric interference problems during subsequent laboratory analysis of the soil samples to determine the hexavalent chromium concentrations, the initial sample results were concluded to be invalid. Therefore, a second soil sampling and analysis was conducted in June 1988, following the same field procedures used for the original sampling. In view of the colorimetric interference problems which adversely affected the original soil sample analyses, the analytical procedures were modified to mitigate similar interferences during analysis of the June 1988 samples.

2

CHAPTER 2

SAMPLING AND ANALYTICAL PROCEDURES

This chapter describes the field sampling and laboratory analytical procedures used during the soil investigation of the Bat Cave Wash area of the Topock Gas Compressor Station (Station). Sample handling and chain-of-custody protocol are also discussed. A total of eleven soil samples were collected during this investigation.

Field Sampling Procedures

Soil sampling was performed on June 23, 1988, by Mr. Ray Kurz of Twining Laboratories, Inc. of Fresno, California. Eleven sediment samples were obtained from selected locations in Bat Cave Wash as shown on Figures 2-1 and 2-2. With the exception of the two upstream background samples, the June 23, 1988, samples were collected at approximately the same locations as the earlier sampling conducted on September 23, 1987. The sample locations were staked to identify each site.

The background samples (BG1 and BG2) were obtained from the wash upstream of the percolation bed (Figure 2-1). Four samples plus one duplicate (Dup-PB2) were collected at the former percolation bed site. These samples were identified as PB1 through PB4 (Figure 2-2). Four samples, identified as DS1 through DS4, were obtained at locations downstream from the percolation bed (Figure 2-1). Two of these samples were collected between the percolation bed and the Interstate 40 crossing. The other two downstream samples were collected just north of the railroad crossing and near the terminus of the wash.

With the exception of sample DS4, the actual sample locations correspond closely to the proposed sample locations presented in the August 1986 sampling plan prepared for this investigation. The proposed location for sample DS4 was near the confluence of Bat Cave Wash with the Colorado River. The location for sample DS4 (Figure 2-1) was moved upstream approximately 1100 feet because ponded water and boggy conditions near the mouth of the wash prevented access to the proposed location for that sample.

The sampling plan called for obtaining fine-grained sediments at each location using hand-sampling techniques. The soil samples were collected in the interval from 1 to 3 feet below grade by digging using a stainless steel shovel and trowel.

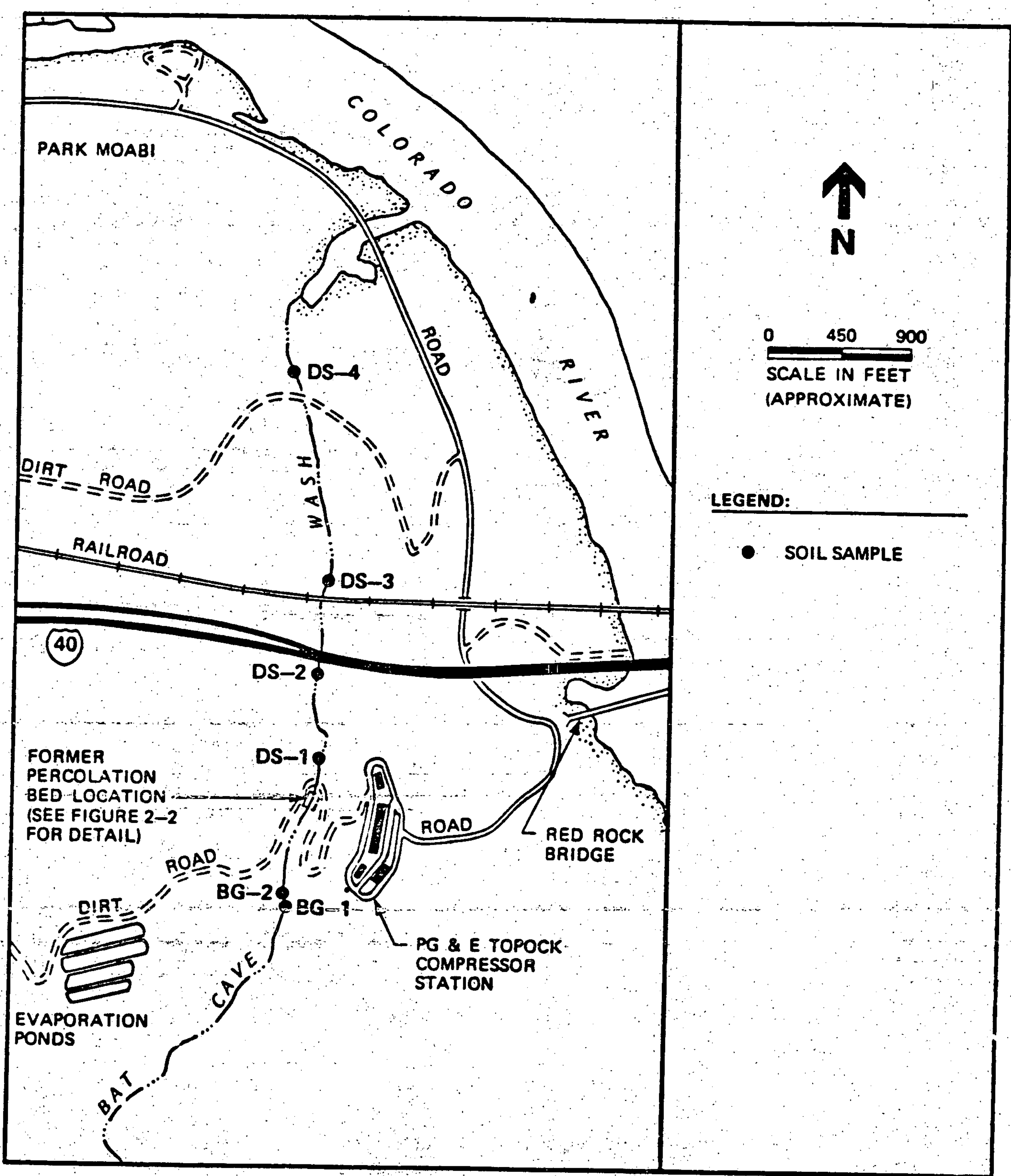

Figure 2-1 Bat Cave Wash Soil Sample Locations

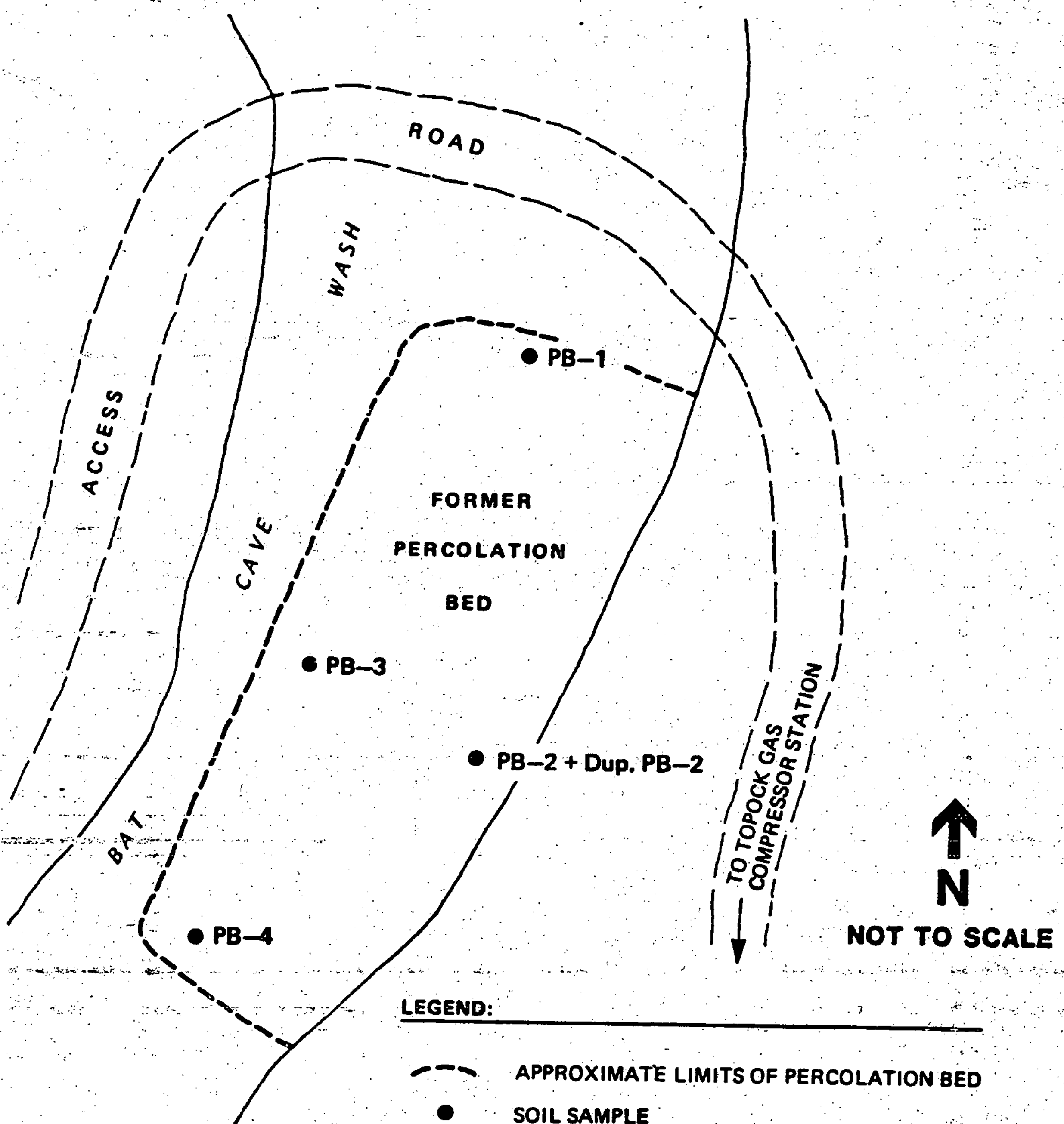

Figure 2-2 Former Percolation Bed Soil Sample Location

The alluvial sediments present in Bat Cave Wash consisted of coarse-grained soils composed predominantly of sand and gravel with cobbles up to 6-inch diameter at the proposed depths of sampling. Silt and clay typically comprised less than 10-percent of the sediments present at each location. The soil was also very dry. The presence of considerable coarse gravel and cobbles larger than the 2-inch diameter, coupled with the lack of fines and moisture which normally provide cohesion, made digging and sampling difficult. In many instances, the coarse-grained soils impeded or prevented penetration of the shovel.

Sample Handling

The samples collected at each location were placed into precleaned eight-ounce glass jars with Teflon-lined caps for transport to the laboratory. Each jar was tightly sealed to maintain sample integrity. Information noted on each jar included the sample number, date, depth interval, samplers initials, and the project number. Each sample container was then placed in a heavy-duty, water-tight, Ziplock plastic bag; stored on ice in a cooler; and delivered to the Twining Laboratory in Fresno, California.

To prevent cross-contamination of samples, sampling equipment was cleaned prior to collection of the initial sample and between subsequent samples. The sampling equipment was cleaned by washing each component in a laboratory-grade detergent (Alconox) and rinsing with tap water. Each component was then rinsed in nitric acid and double rinsed in deionized water. The equipment was then allowed to air dry before reuse.

Chain-of-Custody

Sample identification and chain-of-custody procedures were followed to ensure sample integrity and document sample possession from the time of collection to ultimate sample disposition at the laboratory. To ensure sample integrity, the glass sample jars were sealed with tape and labeled as described above in the field. An adhesive label placed on each jar also contained instructions on the analyses to be performed.

A chain-of-custody card was prepared for the eleven soil samples submitted to the laboratory for analysis. The chain-of-custody card was used to document sample possession from time of collection to its arrival at the laboratory. The card was placed in a water-tight plastic bag and transported to the laboratory in the sample cooler. The samples remained in the sampler's possession until delivery to the Twining Laboratory in Fresno, California on June 24, 1988.

At the laboratory, the sample control officer verified sample integrity and confirmed that all samples were collected, labeled, and preserved in the proper manner. The data on the chain-of-custody card was also reviewed to confirm that the information was complete and that the correct number of samples had been submitted for analysis. The samples were then assigned a log number for identification throughout analysis and reporting. The log number was recorded on the chain-of-custody card and in the legally required log book maintained at the laboratory. Once this procedure was completed, possession of the samples was transferred to the laboratory by the sampler. The date and time of transfer, and the signatures of the persons relinquishing and receiving possession of the samples were noted on the chain-of-custody card.

Analytical Methods

Soil samples collected during this investigation were analyzed for total and hexavalent chromium (CrVI) concentrations. The trivalent chromium (CrIII) concentration of each sample would subsequently be determined by subtracting the CrVI concentration from the total chromium concentration. If the reported concentration of CrVI in milligrams per kilogram (mg/kg) exceeded 10 times the soluble threshold limit concentration (STLC) in milligrams per liter in any sample, an extraction procedure (EP) toxicity test would also be performed on the sample.

Immediately before analysis, soil in the two glass jars that comprised each sample was composited. The composited material was then sieved to separate the coarse fraction from the finer-grained material. Only the material passing through a No. 4 (4.75 millimeter) U.S. Standard Sieve was retained for analysis.

Soil samples were analyzed for total chromium concentrations using Environmental Protection Agency (EPA) Test Methods 3050 and 6010. First, a soil sample fraction is acid digested by EPA Method 3050 to dissolve the chromium and separate it from other constituents in the soil. The dissolution sample is then analyzed using the inductively coupled plasma method (EPA Method 6010) to determine the chromium concentration. The method detection limit for this analysis was 1 mg/kg.

Hexavalent chromium concentrations were determined using EPA Test Methods 3060 and 7197. A soil sample fraction is subjected to the alkaline digestion procedures of EPA Method 3060 to extract both the water-insoluble and water-soluble CrVI and to protect the dissolved CrVI from reduction to CrIII. The dissolution sample then undergoes chelation of the CrVI with ammonium pyrrolidine dithiocarbamate (APCD) followed by extraction with methyl isobutyl ketone (MIBK). The CrVI concentration is then determined by aspirating the extract into the flame of an atomic absorption spectrophotometer (EPA Method 7197). The method detection limit for this analysis was 0.5 mg/kg.

To verify the analytical results determined during this investigation, a second confirmation analytical determination was performed on several of the samples. Samples for which two total chromium and two CrVI determinations were made included PB2, PB3, and DS1.

3

CHAPTER 3

ANALYTICAL RESULTS

The eleven soil samples were analyzed according to the procedures described in Chapter 2 of this report. The results of the laboratory analyses are summarized on Table 3-1 and the laboratory analytical reports are presented in Appendix A. For samples on which a second, verification analysis was performed, the reported results for both analyses are presented for that location. Because none of the hexavalent chromium concentrations exceeded 10 times the soluble threshold limit concentration (STLC) of 5 milligrams per liter for that constituent, the extraction procedure toxicity (EP) tests were not required for any of the samples.

Total Chromium

Total chromium concentrations (Table 3-1) reported for the eleven soil samples ranged from 21 to 270 milligrams per kilogram (mg/kg). The upstream background samples BG1 and BG2 had concentrations of 21 and 23 mg/kg respectively. Concentrations reported for the percolation bed samples PB1 through PB4 ranged from 25 to 270 mg/kg. The duplicate sample, Dup-PB2, collected at the location of sample PB2, had a reported concentration of 37 mg/kg (in close agreement with the 38 mg/kg reported for PB2). Total chromium concentrations for downstream sample sites DS1 and DS2, located between the percolation bed and the Interstate 40 crossing, were 80 and 43 mg/kg, respectively. Chromium concentrations of 25 and 28 mg/kg were reported for downstream samples DS3 and DS4 which were collected between the railroad crossing and the mouth of Bat Cave Wash.

Hexavalent Chromium

Hexavalent chromium (CrVI) concentrations at or above the detection limit of 0.5 mg/kg were reported for only four samples; BG2, PB3, DS1, and DS2 (Table 3-1). No detectable CrVI was present in any of the remaining soil samples analyzed during this investigation (Table 3-1). The detected concentrations ranged from 0.5 to 7.1 mg/kg of CrVI. The highest concentration was reported for sample PB3 collected along the west side of the former percolation bed location. Although sample PB1, collected at the northern end of the former percolation bed contained no detectable CrVI, sample DS1 collected a short distance to the north of the bed had a reported CrVI concentration of 6.8 mg/kg. The somewhat irregular distribution of detectable CrVI may in part result from the unstable nature of CrVI under the dry soil conditions encountered in Bat Cave Wash. With exposure to environmental conditions in the

Table 3-1 Analytical Results--Bat Cave Wash Soil Samples

Sample Number	Sample Location	Concentration (milligrams per kilogram) Total Chromium	Hexavalent Chromium	Trivalent Chromium
BG-1	Background Sample, collected about 670 feet upstream from Percolation Bed location	21	ND	21
BG-2	Background Sample, collected about 30 feet northwest of sample BG-1	23	0.5	22.5
PB-1	Former Percolation Bed, collected at north (downstream) End	45	ND	45
PB-2	Former Percolation Bed, collected along east side	38 38*	ND ND*	38 38
Dup PB-2	Former Percolation Bed, PB-2 duplicate sample	37	ND	37
PB-3	Former Percolation Bed, collected along west side	270 220*	7.1 6.5*	262.9 213.5
PB-4	Former Percolation Bed, collected at south (upstream) end	25	ND	25
DS-1	Downstream from Percolation Bed location, near access road crossing	80 79*	6.8 2.3*	73.2 76.7
DS-2	Downstream from Percolation Bed location, near Interstate 40 crossing	43	0.7	42.3
DS-3	Downstream from Percolation Bed location, near railroad crossing	25	ND	25
DS-4	Downstream from Percolation Bed location, near mouth of Bat Cave Wash	28	ND	28

ND - Not detected, method detection limit for hexavalent chromium is 0.5 mg/kg
* - Constituent value represents the results of a second, verification analysis

wash over the 18-years since percolation bed operations ceased, most of the CrVI that might have been present in the soil has undoubtedly been reduced to trivalent chromium (CrIII).

Trivalent Chromium

Trivalent chromium concentrations were calculated by subtracting the concentration of CrVI from the concentration of total chromium reported in each sample (Table 3-1). Because most of the samples had no detectable concentrations of CrVI, the trivalent chromium concentrations reported on Table 3-1 are in most cases the same as the total chromium concentration. Trivalent chromium concentrations ranged from 21 to 262.9 mg/kg (Table 3-1).

4

CHAPTER 4

DISCUSSION AND CONCLUSIONS

The results of the soil sampling and analysis in the Bat Cave Wash portion of the Topock Gas Compressor Station (Station) indicate that chromium concentrations slightly above background levels are present in soil at the former percolation bed site and for a distance of approximately 800 feet downstream from the percolation bed site. However, these concentrations were below the California Code of Regulations Title 22 total threshold limit concentration (TTLC) and soluble threshold limit concentration (STLC) values for each chromium species evaluated as part of this investigation.

Discussion

The distributions of total, hexavalent, and trivalent chromium concentrations in Bat Cave Wash are illustrated graphically on Figures 4-1, 4-2, and 4-3 respectively. The figures are profiles which begin at the location of the upstream background sample (BG1) and proceed in a downstream direction along the wash to the sample location nearest the Colorado River (DS4). It should be noted that while the total and trivalent chromium concentration scales on Figures 4-1 and 4-3 range from 0 to 300 milligrams per kilogram (mg/kg), the hexavalent chromium scale on Figure 4-2 only ranges from non-detected (ND) to 20 mg/kg. For samples where a second, verification analysis was run and a different result was obtained, both concentration values were shown on the appropriate figure.

The total chromium concentrations reported for samples BG1 and BG2 (21 mg/kg and 23 mg/kg, respectively) represent the background concentration of total chromium that is present naturally at two locations in the Bat Cave Wash soil upstream from the percolation bed. These samples were collected approximately 670 feet upstream from the former percolation bed and are remote from potential sources of chromium produced by operations at the Station. The total chromium concentrations reported for samples at the percolation bed and immediately downstream ranged from about 3 mg/kg to 248 mg/kg above the average background concentration as represented by samples BG1 and BG2 on Figure 4-1. In contrast, the two samples collected furthest downstream had reported total chromium concentrations only 3 mg/kg and 6 mg/kg above the average background concentration.

The total chromium concentrations of 58 and 21 mg/kg above average background reported for samples DS1 and DS2, collected in Bat Cave Wash between the former percolation bed and the Interstate

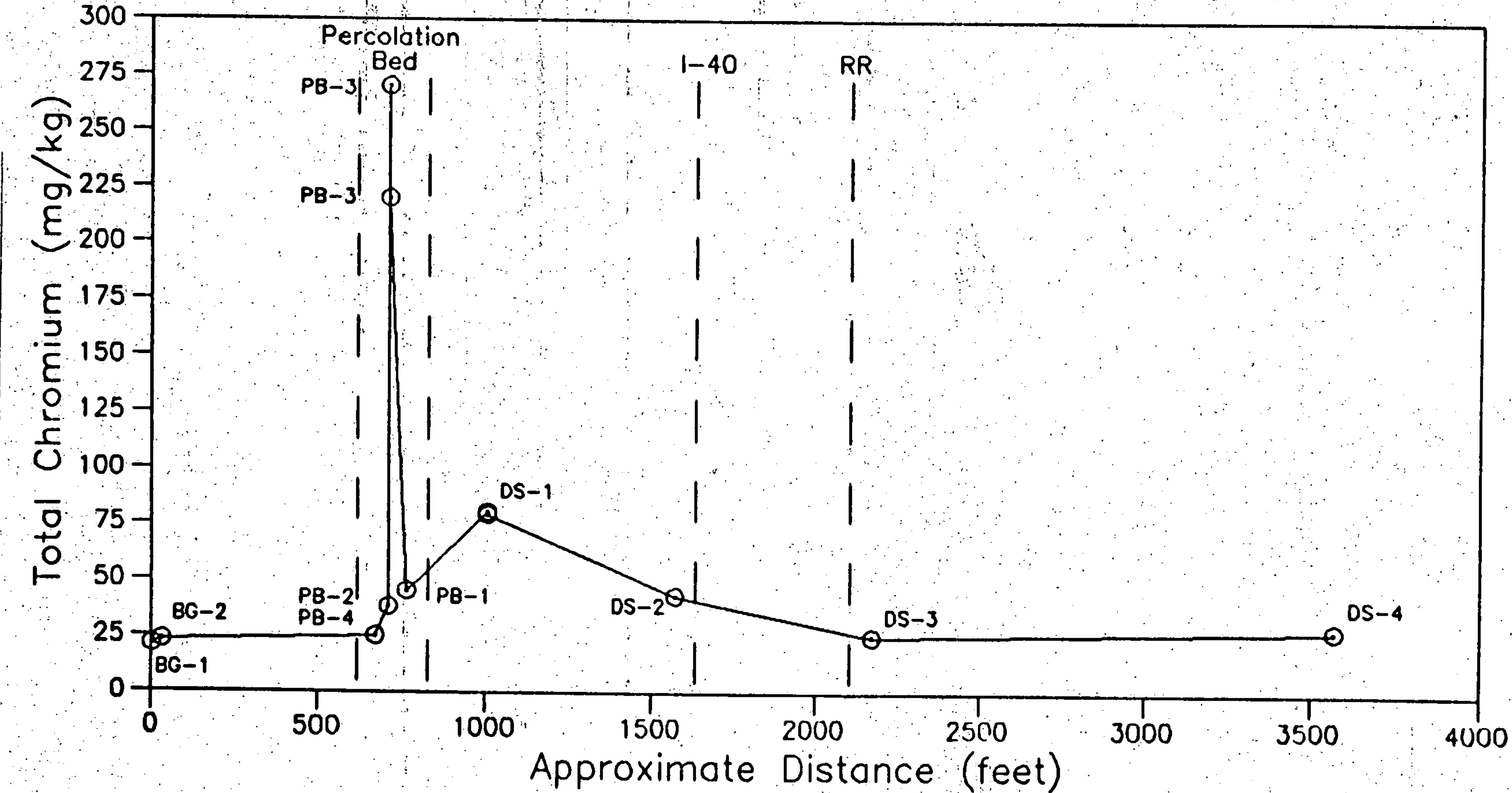

Figure 4-1 Total Chromium in Soil

BROWN AND CALDWELL CONSULTING ENGINEERS

BROWN AND CALDWELL CONSULTING ENGINEERS

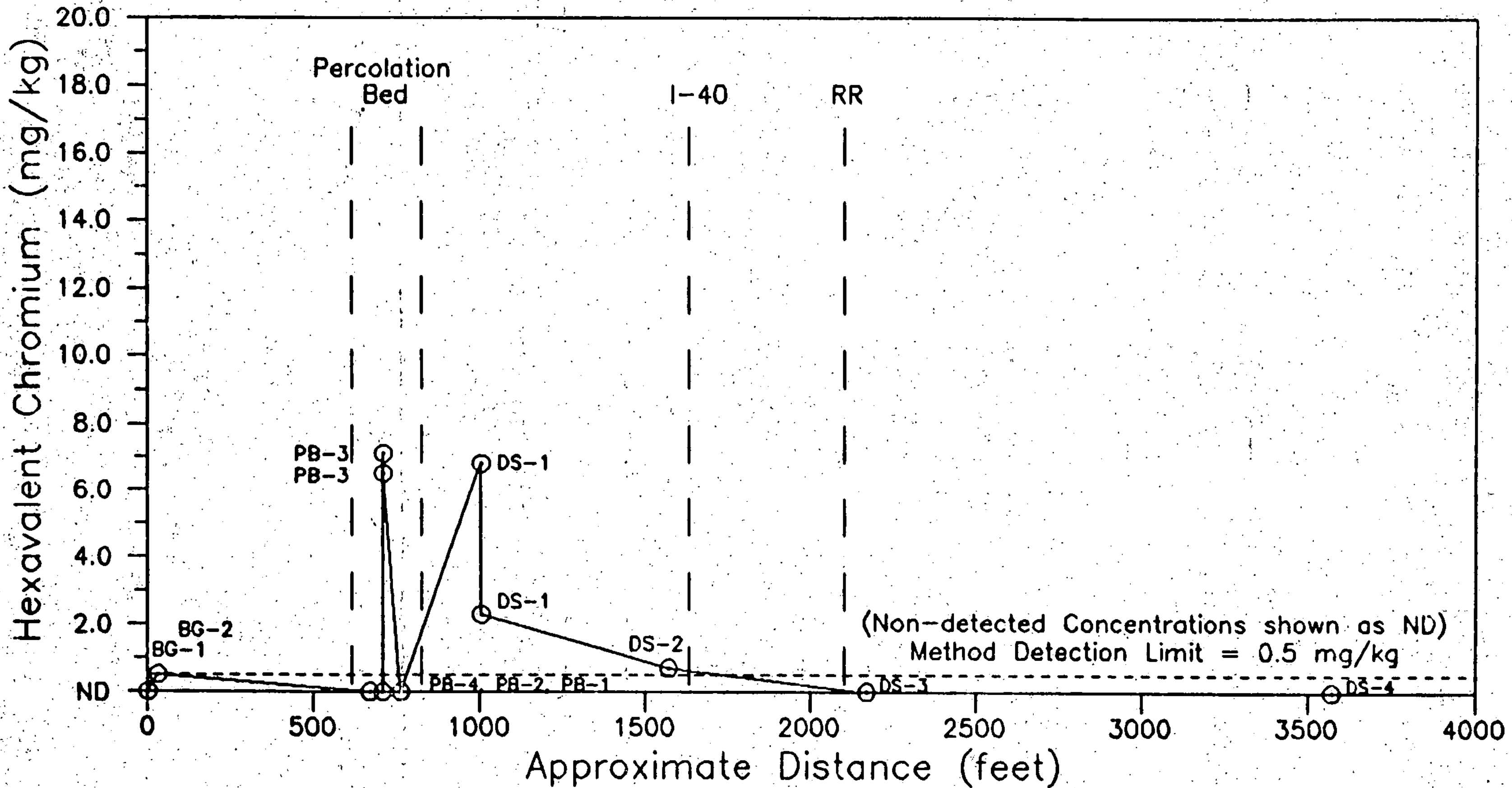

Figure 4-2 Hexavalent Chromium in Soil

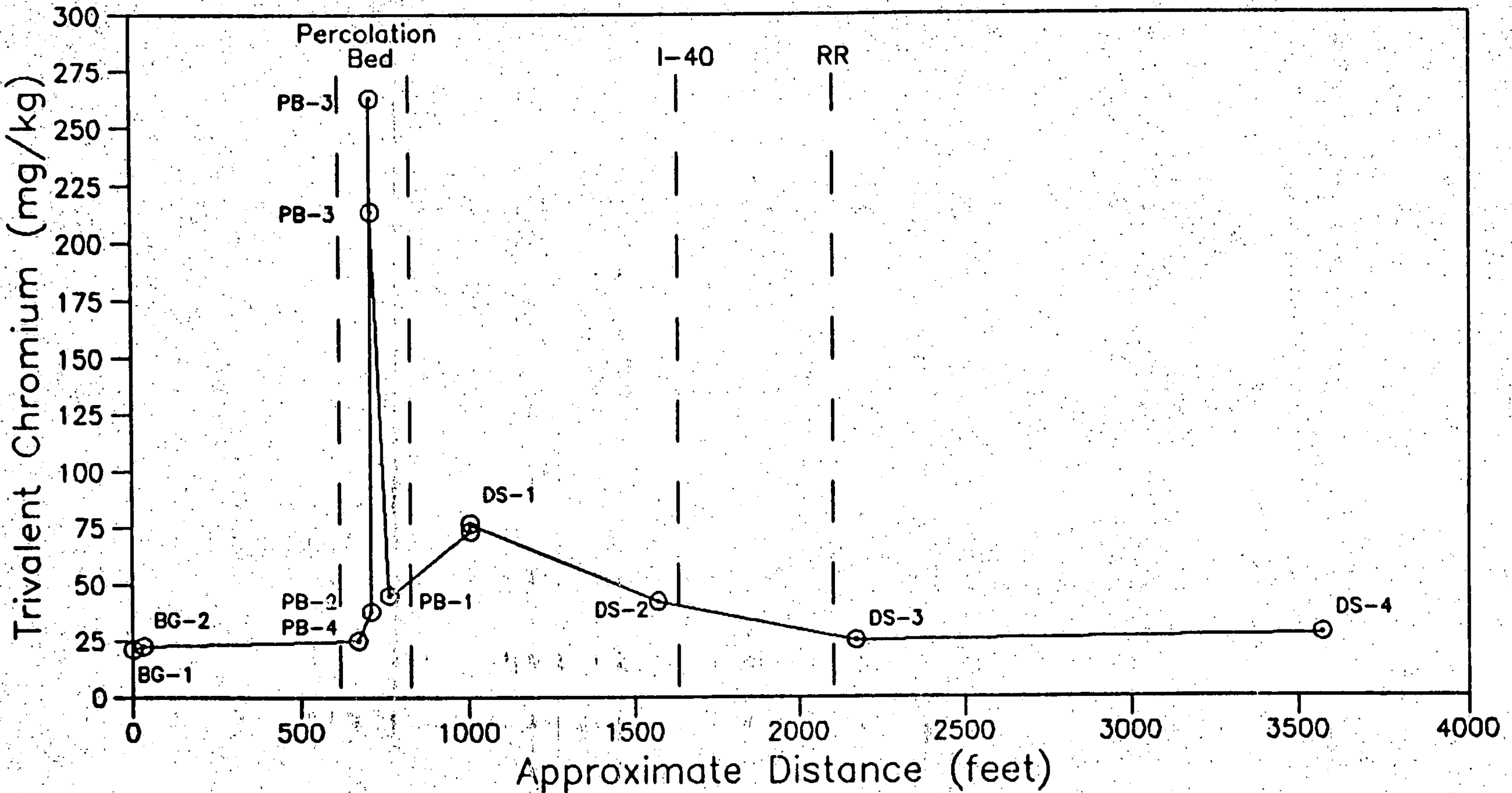

Figure [illegible]-3 Trivalent Chromium In Soil

40 highway crossing, may reflect the actual movement of sediments down the wash toward the Colorado River during periods of surface runoff. In contrast, total chromium concentrations only slightly above background were reported for the samples collected downstream from the Interstate 40 and railroad crossings (DS3 and DS4). These data suggest that restriction of the wash at the two crossings has effectively prevented downstream movement of sediments beyond those points. At both locations, the wash has been blocked by constructed fill and potential runoff has been channelled into concrete culverts.

Typically, where natural channel conditions are modified by manmade structures, backwater conditions develop in the wash upstream of the manmade structures due to the restricted flow potential at those locations during the intense, short duration runoff events. The backwater conditions that develop in the wash create a channel reach where the streamflow velocities are significantly reduced and the sediment carrying capacity of the runoff flow declines correspondingly. The net result is that much of the suspended sediment load and almost all of the bed load are deposited in the backwater area and only a small part of the total sediment load is transported further downstream. It is believed that deposition of sediment in Bat Cave Wash upstream of the Interstate 40 and railroad crossings under the circumstances described above has limited the downstream movement of chromium in the wash.

Figure 4-2 presents the distribution of hexavalent chromium (CrVI) in soil in a downgradient direction along Bat Cave Wash. The general trend of CrVI concentrations is similar to that presented on Figure 4-1 for total chromium, with CrVI concentrations above upstream background levels present at the site of the former percolation bed and downstream to the Interstate 40 crossing. However, while total chromium concentrations above upstream background levels were reported for all samples collected throughout this area, several of the percolation bed samples (PB1, PB2, and PB4) contained no detectable CrVI. Similarly, downstream sample DS2 had a reported CrVI concentration of 0.7 mg/kg, just slightly above the detection limit of 0.5 mg/kg for that analysis. As might be expected, the highest CrVI concentration was reported for sample PB3, which also had the highest reported total chromium concentration.

While CrVI concentrations above background levels are present in Bat Cave Wash at the former percolation bed location and in the downstream area between the bed and the Interstate 40 highway crossing, the levels of CrVI in the soil are very low and they are distributed irregularly. Only one of four samples collected at the percolation bed location (PB3) contained detectable hexavalent chromium. The sample collected immediately downstream from that location (PB1) contained no detectable CrVI. These results are not unexpected in view of the generally unstable nature of CrVI when subjected to long-term environmental exposure.

Hexavalent chromium is reduced to trivalent chromium (CrIII) particularly when the CrVI is in long term contact with soil material and water (Nyer, 1985 and EPRI, 1988). According to information presented at the International Conference on Heavy Metals in the Environment (Allaway, 1975), test data indicate that the addition of CrVI to soil results in a rapid and substantial reduction of the CrVI. Studies also suggest that concentrations of CrVI in the range of 5 to 10 milligrams per kilogram (mg/kg) may be reduced to CrIII within as little as one year after being introduced into the soil (Allaway, 1975). Over the 18-years since discharge to the Bat Cave Wash percolation bed ceased, almost all of the CrVI that may have been present in the soil has probably been reduced to CrIII.

The distribution of trivalent chromium along Bat Cave Wash is presented on Figure 4-3. As that figure illustrates, the plot of trivalent chromium concentrations is essentially the same as that for the total chromium concentrations presented on Figure 4-1. Because the trivalent chromium concentrations represent the difference between the total and hexavalent fractions, duplication of the total chromium plot was expected due to the very low CrVI concentrations reported for all of the samples.

Conclusions

Although the data collected during this investigation indicate that concentrations of chromium above background are present in soil at the former percolation bed and for a distance of approximately 800 feet downstream, the magnitude of these chromium concentrations is slight. Natural levels of chromium in soil and bedrock worldwide range from about 2 to 3,400 mg/kg (NRC, 1974). As Figure 4-1 graphically illustrates, the concentrations reported for the eleven Bat Cave Wash soil samples were all well within this range of natural soil concentrations. <u>With the exception of samples PB3 and DS1,</u> all of the reported chromium concentrations were below or only slightly above the average natural soil concentration of approximately 37 mg/kg reported for the United States (Shacklette et al, 1971).

They are below DHS TTLC limits.

The magnitude of chromium in Bat Cave Wash can also be evaluated in comparison to the California Department of Health Services (DHS) total threshold limit concentration (TTLC) and soluble threshold limit concentration (STLC) for chromium in waste. The TTLC established for total and trivalent chromium in waste is 2,500 mg/kg while the TTLC for CrVI is 500 mg/kg (California Code of Regulations (CCR) Title 22, 1985). The TTLC for waste is the concentration of a substance in mg/kg above which that substance is considered a hazardous waste. The TTLC for total chromium is more than 9 times higher than the maximum chromium concentration reported for the Bat Cave Wash soils while the TTLC for CrVI is 70 times higher than the maximum CrVI concentration reported.

The STLC for waste is the concentration of the extracted soluble fraction of a substance, expressed in milligrams per liter (mg/l), above which that substance is considered a hazardous waste. The STLC for hexavalent chromium in waste is 5 mg/l (California Code of Regulations (CCR) Title 22, 1985). Soluble constituent concentrations can be determined by performing the extraction procedure (EP) toxicity test as specified in Environmental Protection Agency (EPA) SW-846 or the Waste Extraction Test (WET) as specified in CCR Title 22. The laboratory procedures used for both tests involve a 10-fold dilution of the initial sample during analysis. Based on the CrVI concentrations reported for the eleven Bat Cave Wash soil samples, performance of the EP toxicity or WET analyses could only have resulted in soluble CrVI concentrations of up to 0.71 mg/l. That concentration is more than 7 times lower than the STLC for CrVI.

All of these data suggest that while discharge of cooling tower wastewater into the percolation bed may have resulted in a slight chromium concentration increase in soil, chromium concentrations in Bat Cave Wash soils remain very low and do not pose a significant threat to the environment in the Topock area. In addition, because discharge to the percolation bed ceased 18 years ago, there is no potential for additional accumulation of chromium in soil in the wash area resulting from operations at the Station. Based upon these factors, further evaluation and monitoring of chromium in soil at the station seems unnecessary.

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2. Brown and Caldwell. Sediment Sampling and Analysis Plan for Percolation Bed and Bat Cave Wash, Topock Compressor Station. Prepared for Pacific Gas and Electric Company. Brown and Caldwell project number 2339, August 1986.

3. Electric Power Research Institute (EPRI). Chromium Reactions in Geologic Materials. EPRI EA-5741. April 1988.

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5. Nyer, E. K. Groundwater Treatment Technology. New York: San Nostrand Reinhold Company. 1985.

6. Shacklette, H. T., Hamilton, J. C., Boerngen, J. G., and Bowies, J. M. "Elemental Composition of Surficial Materials in the Conterminous United States" United States Geological Survey Professional Paper 574-D. Washington, D. C.: U.S. Government Printing Office. 1971.

7. Title 22, California Code of Regulations, Division 4-Environmental Health, Section 66699. 1985.

8. United States Environmental Protection Agency: Test Methods for Evaluating Solid Waste. SW-846, Volume 1C. November 1986.

A

APPENDIX A

LABORATORY ANALYTICAL REPORTS

The Twining Laboratories, Inc.

Since 1898

Geotechnical and Environmental Consultants • Engineering and Chemical Laboratories

September 9, 1988

Brown and Caldwell
P.O. Box 8045
Walnut Creek CA 94596-1220

Attention: Pat Wiegand

Mr. Wiegand:

Enclosed is the second page of the report sent to Pacific Gas and Electric concerning the samples from the Topock Compressor Station. Methods used for the analyses are listed below.

Total chromium
- Digestion: EPA Method 3050, EPA SW-846 ed.3
- Analysis: EPA Method 6010, EPA SW-846 ed.3

Hexavalent chromium
- Digestion: EPA Method 3060, EPA SW-846 ed.2
- Analysis: EPA Method 7197, EPA SW-846 ed.3

I hope this answers the questions you have. Please contact me if you have any further questions.

THE TWINING LABORATORIES, INC.

John Bricarello
Chemistry Division

JB:clb

BROWN AND CALDWELL CONSULTING ENGINEERS

2527 Fresno Street • P.O. Box 1472
Fresno, California 93716 • (209) 268-7021

1405 Granite Lane, Suite 1
Modesto, California 95351 • (209) 523-0994

9401 West Goshen Avenue
Visalia, California 93291 • (209) 651-2190

5301 Office Park Drive, Suite 310
Bakersfield, California 93309 • (805) 322-5216

August 9, 1988

Examination 688-2942
Invoice #8897
Page 2

For: Pacific Gas and Electric Company
375 N. Wiget Lane, Suite 130
Walnut Creek, CA 94598
ATTN: Don York

Sample: Soils

Received: 6-24-88 from Ray Kurz of Twining Labs

Identification: As Below

	Chromium(Cr), total mg/kg as rec'd		Chromium(Cr) hexavalent (Cr^{+6}) mg/kg as rec'd	
	Run1	Run2	Run1	Run2
S-1 BG-1 120' south of gas line	21	---	ND	---
S-2 BG-2 30' northwest of sample 1	23	---	0.5	---
S-3 PB-1 north end down stream	45	---	ND	---
S-4 PB-2 east side	38	38	ND	ND
S-4 Dup PB-2 east side	---	37	---	ND
S-5 PB-3 west side	270	220	7.1	6.5
S-6 PB-4 south	25	---	ND	---
S-7 DS-1 by wash	80	79	6.8	2.3
S-8 DS-2 near highway	43	---	0.7	---
S-9 DS-3 1st north of railroad tracks	25	---	ND	---
S-10 DS-4 2nd north of railroad tracks	28	---	ND	---
MDL	1		0.5	

---:not run
mg/kg:milligram per kilogram
MDL:Method Detection Limit
ND:None detected

THE TWINING LABORATORIES, INC.

John Bricarello
Chemistry Division

JB:clb

STATE OF CALIFORNIA

OFFICE MEMO
STD. 100 (REV. 11-75)

DATE: 6/24/88

TO:
Ric

ROOM NUMBER

FROM:
John

PHONE NUMBER

SUBJECT: PG+E, Topock

This is a former percolation bed and waste discharge area for the compressor station. Apparently effluents with high concentrations of Cr^{+6} were discharged to this area in the pre-RCRA days and now the soils have high levels of Cr^{+6}. I believe we should handle this site as a walk-in and evaluate information ~~they~~ PG+E currently has or will be getting to see if this should qualify for the BEP or NPL.

Thanx

STATE OF CALIFORNIA

OFFICE MEMO

STD 100 (REV 12/85)

DATE 9/23/87

TO: Mukul

ROOM NUMBER

FROM: John

PHONE NUMBER

SUBJECT: PG&E Topock

Attached is a sampling work plan for the Bat Cave Wash at subject. My recommendation is to review attached and our files as well as discuss site history with Dave Chase. Based on your findings, we'll decide whether to get involved

Thanx

Put your thoughts to work. Submit a **MERIT AWARD SUGGESTION.**

PACIFIC GAS AND ELECTRIC COMPANY

P.O. BOX 7640 • SAN FRANCISCO, CALIFORNIA 94120 • (415) 972-7746 • TELECOPY (415) 972-5059

V. C. FURTADO, Ph.D.
MANAGER
ENVIRONMENTAL SERVICES

September 19, 1986

Mr. Angelo Bellomo, Chief
Toxic Substances Control Division
California Department of Health Services
Southern California Section
107 South Broadway, Room 7011
Los Angeles, California 90012

Dear Mr. Bellomo:

Subject: Pacific Gas and Electric Company
Topock Compressor Station, Needles, California

As indicated in a letter from your Department to Pacific Gas and Electric Company dated April 22, 1986, it was agreed that PGandE would prepare and implement a sampling and analysis plan for the Bat Cave Wash and former percolation bed areas of PGandE's Topock Compressor Station, located in Needles, California.

Attached is a copy of a proposed sampling and analysis plan which was prepared by our consultant, Brown and Caldwell. The scope of the field investigation plan is based on the sampling and analysis plan which was prepared by DHS and consists of taking soil samples in the percolation bed and Bat Cave Wash. Samples will be analyzed for total and hexavalent chromium according to procedures specified in the attached plan. PGandE plans to have Brown and Caldwell conduct the field activities sometime in mid-October. Please advise us if members of your Department would like to be present to either observe or take duplicate samples during sampling.

We would be pleased to meet with your Department to discuss the proposed workplan prior to conducting field tests. If you have any questions on the proposed sampling and analysis plan or if you wish to set up a meeting, please call me at (415) 972-7746 or Suzanne Chaewsky at (415) 972-7745.

Sincerely,

Victor C. Furtado

cc: Mr. Michael Pardee
Abandoned Sites Project
California Department of
Health Services
714/744 P Street
Sacramento, California 95814

Attachment

PACIFIC GAS AND ELECTRIC COMPANY

P.O. BOX 7640 • SAN FRANCISCO, CALIFORNIA 94120 • (415) 972-7746 • TELECOPY (415) 972-5030

V. C. FURTADO, Ph.D.
MANAGER
ENVIRONMENTAL SERVICES

September 18, 1987

Mr. Angelo Bellomo
Chief, Southern California Section
Toxic Substances Control Division
California Department of Health Services
Southern California Section
107 South Broadway, Room 7011
Los Angeles, California 90012

Dear Mr. Bellomo:

Subject: Pacific Gas and Electric Company
Topock Compressor Station, Needles, California

This letter summarizes a telephone conversation of August 13, 1987, between Ms. Sue Chaewsky of PGandE and Mr. John Scandura of your staff regarding a sampling and analysis plan (Attachment 1) which was submitted to the Department of Health Services (DHS) in September, 1986, for the Bat Cave Wash and former percolation bed areas of Pacific Gas and Electric Company's (PGandE) Topock Compressor Station, located in Needles, California.

The sampling and analysis plan was prepared by our consultant, Brown and Caldwell, in response to a request for information from DHS concerning the possible presence of chromium in soils in the Bat Cave Wash. PGandE based its sampling and analysis plan on a DHS plan which was prepared in January, 1986. The DHS sampling and analysis plan was based on information presented in the Preliminary Assessment Summary (Attachment 2) which was prepared by the DHS Abandoned Sites Project in Sacramento.

As Ms. Chaewsky was informed, DHS is under a mandate from the California legislature to work only on those sites which are listed on the Expenditure Plan. For a site not on the list, your agency will evaluate the conditions at the site (i.e., conduct a preliminary assessment) to determine if the site warrants DHS involvement. It is our understanding that the Bat Cave Wash area of the Topock Compressor Station has not been listed on the Expenditure Plan and, therefore, you have not been able to devote staff time to reviewing the sampling plan.

PGandE had not initiated the sampling pending approval from DHS. However, as we discussed with Mr. Scandura, we will now proceed with the sampling to avoid any further delay. We will inform you of our schedule for sampling and will forward the results to you when they are available.

If you have any questions on the proposed sampling and analysis plan or if you wish to be present during sampling, please call me at (415) 972-7746 or Suzanne Chaewsky at (415) 972-7745.

Sincerely,

Attachments

cc: Mr. Michael Pardee
Abandoned Sites Project
California Department of
Health Services
714/744 P Street
Sacramento, California 95814

Pacific Gas and Electric Company

One California Street, Room F 1601
San Francisco, CA
415/972 7746
Telex 972 6868

Mailing Address
PO Box 7640
San Francisco, CA 94120

Victor C. Furtado, Ph.D.
Manager
Environmental Services

June 14, 1988

RECEIVED

JUN 17 1988

Mr. Ted Rauh
Acting Chief, Toxic Substances Control Division
California Department of Health Services
Southern California Section
107 South Broadway, Room 7011
Los Angeles, California 90012

Dear Mr. Rauh:

Subject: Pacific Gas and Electric Company
<u>Topock Compressor Station, Needles, California</u>

As discussed with Mr. John Scandura in August, 1987, and with Mr. Mukul Adawar in December, 1987, of your staff, PG&E has implemented a sampling and analysis plan for the Bat Cave Wash and former percolation bed areas of PG&E's Topock Compressor Station, located in Needles, California. The scope of the plan was previously discussed with your staff.

Field and laboratory work was conducted in the last quarter of 1987. Due to the procedures used to analyze the soil samples, the analytical detection limit that was achieved by the laboratory for hexavalent chromium was 10 ppm. PG&E believes that a lower detection limit would provide more useful information in this situation. As a result, PG&E is in the process of resampling the above-mentioned areas of the facility for analysis by another laboratory which can achieve a lower detection limit (to 1.0 ppm) for hexavalent chromium.

PG&E will submit to your Department a report containing these results when they are available. If you have any questions regarding this matter, please contact me at (415) 972-7746 or Ms. Suzanne Chaewsky of my staff at (415) 972-7734.

Sincerely,

Victor C. Furtado

cc: Mr. Michael Pardee
Abandoned Sites Project
California Department of Health Services
714/744 P Street
Sacramento, California 95814

Sagalen, Barry
Is Larry handling this as a walk-in? If so, please pass on to him.

Thanx
JS

any

Mailing Address
P.O. Box 7640
San Francisco, CA 941[illegible]

cting Chief

trol Division
t of Health Services
Room 7011
nia 90012

y Vitale

s and Electric Company
pressor Station, Needles, California

formation is the report, "Bat Cave Wash Soil
ck Gas Compressor Station", which was prepared by
n and Caldwell Consulting Engineers.

This report summarizes the results of a preliminary soils investigation performed in the Bat Cave Wash area of PG&E's Topock Compressor Station located near Needles, California. This investigation was first performed in September, 1987; as we indicated to your Department in June, 1988, (see enclosed letter) the area was resampled because the procedures used by the laboratory for the original samples did not achieve an analytical detection limit for hexavalent chromium below 10 ppm.

Resampling of the wash was conducted in June, 1988, and the resampling as well as the initial sampling were performed based on the sampling and analysis plan that was submitted to your Department on September 19, 1986. The soil sampling consisted of taking soil samples at ten locations in Bat Cave Wash and analyzing them for total, trivalent, and hexavalent chromium. Four subsamples were taken at each location at half-foot increments in the interval of one to three feet below grade and composited prior to analysis.

The results of this investigation indicate that trivalent and hexavalent chromium are present above background levels in a few locations and at low concentrations in the area of the former percolation bed. The Total Threshold Limit Concentration (TTLC) of 2500 mg/kg for total chromium as set forth in Section 66699 of Title 22 of the California Code of Regulations is about ten times greater than the highest chromium concentration found in the samples tested. Moreover, the TTLC for hexavalent chromium of 500 mg/kg is 70 times higher than the highest sample concentration for hexavalent chromium

Pacific Gas and Electric Company

One California Street [illegible]
San Francisco CA [illegible]
[illegible]
PO Box [illegible]
San Francisco CA [illegible]

[illegible]
Environmental Services

October 19, 1988

RECEIVED
OCT 21 1988
Toxic Substances Control Division
Southern California Section
Los Angeles

Mr. John Scandura, Acting Chief
Region 4
Toxic Substances Control Division
California Department of Health Services
107 South Broadway, Room 7011
Los Angeles, California 90012

Attention: Mr. Larry Vitale

Dear Mr. Scandura:

Subject: Pacific Gas and Electric Company
Topock Compressor Station, Needles, California

Enclosed for your information is the report, "Bat Cave Wash Soil Investigation - Topock Gas Compressor Station", which was prepared by our consultant, Brown and Caldwell Consulting Engineers.

This report summarizes the results of a preliminary soils investigation performed in the Bat Cave Wash area of PG&E's Topock Compressor Station located near Needles, California. This investigation was first performed in September, 1987; as we indicated to your Department in June, 1988, (see enclosed letter) the area was resampled because the procedures used by the laboratory for the original samples did not achieve an analytical detection limit for hexavalent chromium below 10 ppm.

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The results of this study indicate that the concentrations of chromium found in soils in the area of the former percolation bed are low and do not pose a threat to public health or the environment. As a result, PG&E believes that further evaluation and monitoring are unnecessary. If you have any questions or if you need additional information, please call me at (415) 972-7746 or Ms. Suzanne Chaewsky of my staff at (415) 972-7734.

Sincerely,

Enclosures

cc: Mr. Michael Pardee
Abandoned Sites Project
California Department of Health Services
714/744 P Street
Sacramento, California 95814

Pacific Gas and Electric Company

One California Street, Room F 1601
San Francisco, CA
415/972 7746
Telex 972 6888
Mailing Address
PO Box 7640
San Francisco, CA 94120

Victor C Furtado, Ph D
Manager
Environmental Services

June 14, 1988

Mr. Ted Rauh
Acting Chief, Toxic Substances Control Division
California Department of Health Services
Southern California Section
107 South Broadway, Room 7011
Los Angeles, California 90012

Dear Mr. Rauh:

Subject: Pacific Gas and Electric Company
Topock Compressor Station, Needles, California

As discussed with Mr. John Scandura in August, 1987, and with Mr. Mukul Adawar in December, 1987, of your staff, PG&E has implemented a sampling and analysis plan for the Bat Cave Wash and former percolation bed areas of PG&E's Topock Compressor Station, located in Needles, California. The scope of the plan was previously discussed with your staff.

Field and laboratory work was conducted in the last quarter of 1987. Due to the procedures used to analyze the soil samples, the analytical detection limit that was achieved by the laboratory for hexavalent chromium was 10 ppm. PG&E believes that a lower detection limit would provide more useful information in this situation. As a result, PG&E is in the process of resampling the above-mentioned areas of the facility for analysis by another laboratory which can achieve a lower detection limit (to 1.0 ppm) for hexavalent chromium.

PG&E will submit to your Department a report containing these results when they are available. If you have any questions regarding this matter, please contact me at (415) 972-7746 or Ms. Suzanne Chaewsky of my staff at (415) 972-7734.

Sincerely,

Victor C. Furtado

cc: Mr. Michael Pardee
Abandoned Sites Project
California Department of Health Services
714/744 P Street
Sacramento, California 95814

Hazardous Waste Management Branch

MEMO OF CALL

Name: Sue Cherosky

Firm: PG&E

Address: San Francisco Bay Area

Date: 9-21-87

Time: 2:00 PM

Person Taking or Making Call: Maxine Richey

Telephone No.: (415) 972-7745

Subject: Soil Sampling at Needles Station on 9-23-87

Message: Sue called to let you know that 10 soil samples will be taken at PG&E's Topock Compressor Station, Bat Cave Wash, in Needles on Wednesday 9-23-87. It will be a one-day sampling event with soil samples being hand-augered to 3' depths.

Sue said she had submitted a sampling plan to your attention some time back and you had explained the Department's position on working on Expenditure Plan Sites only, etc.

Anyway, she wants you to know the sampling will take place Wednesday and if you have any questions you may call her.

The analytical results will be forwarded to you as they become available.

BROWN AND CALDWELL

CONSULTING ENGINEERS

SEDIMENT SAMPLING AND ANALYSIS PLAN
FOR
PERCOLATION BED AND BAT CAVE WASH

TOPOCK COMPRESSOR STATION
PACIFIC GAS AND ELECTRIC COMPANY

SEPTEMBER 1986

BROWN AND CALDWELL
PLEASANT HILL, CALIFORNIA

CONTENTS

LIST OF FIGURES

SEDIMENT SAMPLING AND ANALYSIS PLAN
FOR
PERCOLATION BED AND BAT CAVE WASH,
TOPOCK GAS COMPRESSOR STATION

This sampling and analysis plan has been prepared in order to satisfy a January 1986 request by the California Department of Health Services (DHS) for information concerning Pacific Gas and Electric Company's (PGandE) possible chromium contamination of soils in Bat Cave Wash at Topock Gas Compressor Station. This plan is based on a U.S. Environmental Protection Agency/DHS sampling plan dated January 1986 which was sent to PGandE. The following sections of this plan describe the sampling and analysis of sediments within Bat Cave Wash to determine if chromium is present in the sediments.

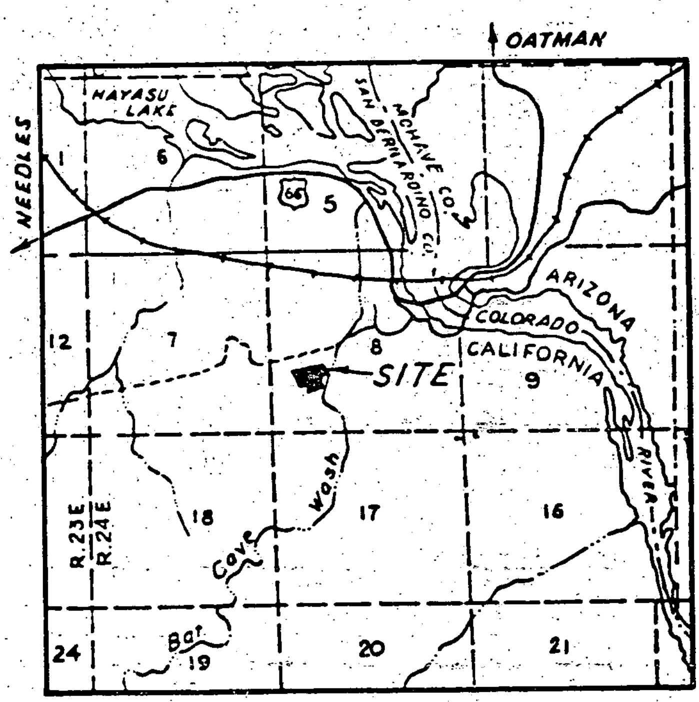
Background

The Topock Compressor Station is located 15 miles southeast of Needles, California (Figure 1). Two cooling towers provide for cooling of natural gas which is compressed at the station and for cooling of lubricating oil used in the compressor engines. Until October 1985, a chromium-based corrosion inhibitor was added to the cooling tower to prevent corrosion of the heat exchanger bundles and the cooling tower structures. In October 1985, this corrosion inhibitor was replaced by a nonhazardous phosphate-based corrosion inhibitor.

From 1951 to 1969, cooling tower wastewater containing chromium was discharged to a percolation bed in Bat Cave Wash (Figure 2). Bat Cave Wash trends north-south through the property and drains to the Colorado River to the north. Except during seasonal storms, the wash is dry.

Rationale

The purpose of this soil sampling is to document chromium concentrations in soils within the former percolation beds and to determine if chromium has migrated from the percolation beds. Four sample locations will be within the percolation bed area to quantify chromium concentrations within the former disposal area. Four soil samples within Bat Cave Wash downstream from the percolation bed will be used to determine if chromium has migrated from the percolation bed area. One soil sample will be obtained upstream from the percolation bed to identify background chromium concentrations.



SCALE: 1" = 1 MILE

Figure 1 Vicinity Map

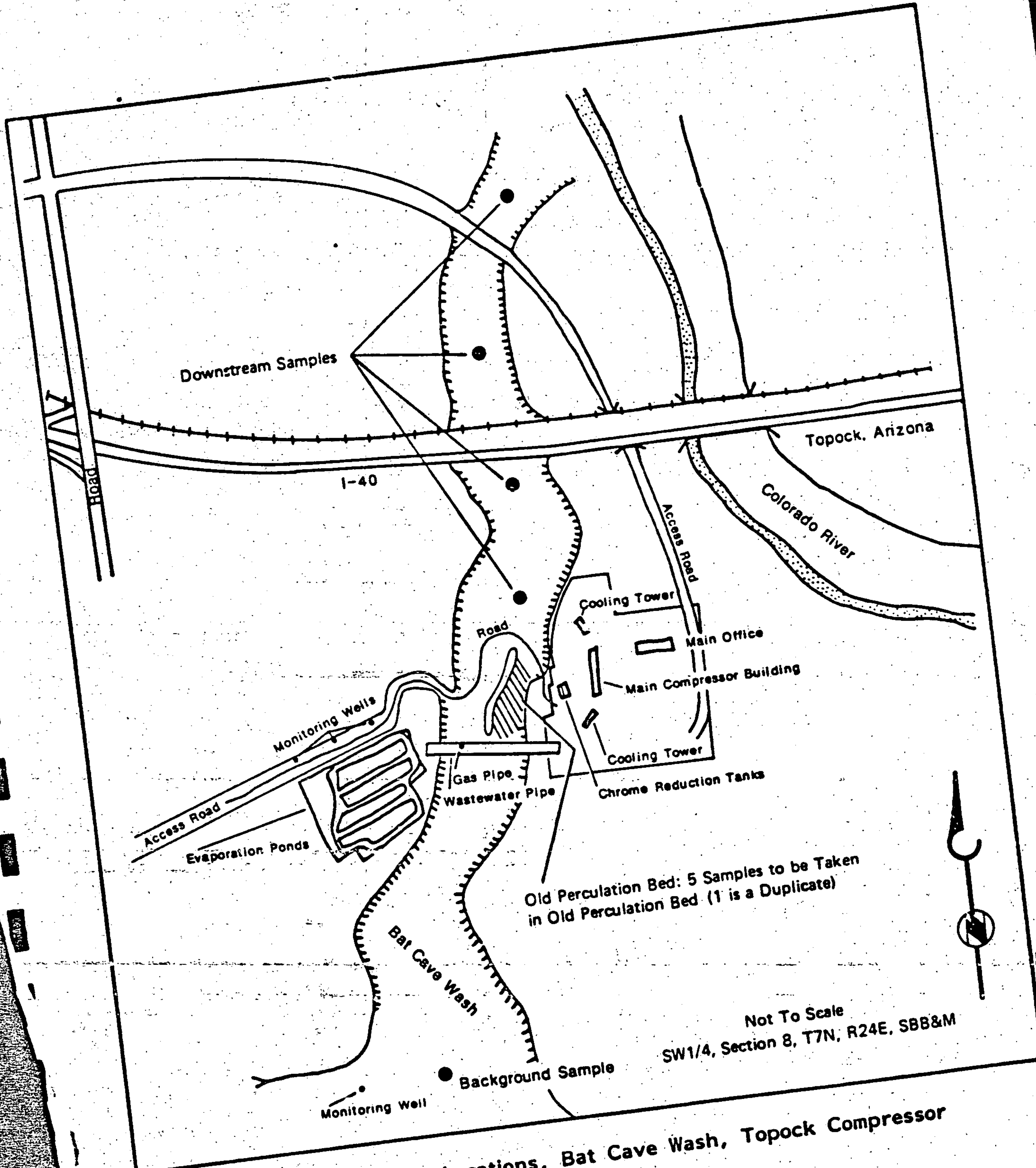


Figure 2 Sampling Locations, Bat Cave Wash, Topock Compressor Station

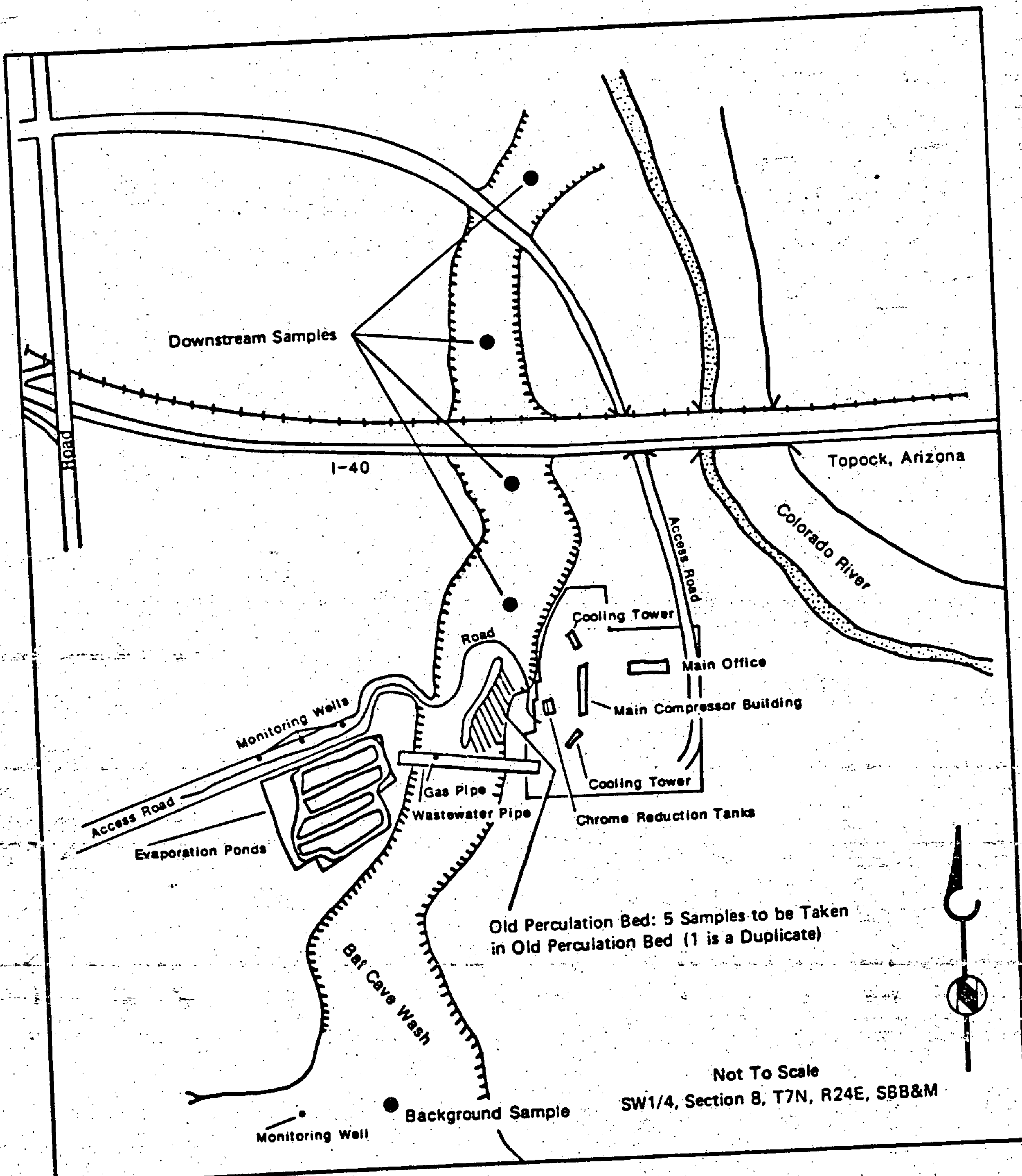


Figure 2 Sampling Locations, Bat Cave Wash, Topock Compressor Station

Sampling

Ten sediment samples, including one duplicate and one background sample, will be collected from the nine locations shown on Figure 2. Four locations will be within the old percolation beds and a duplicate soil sample will be obtained at one of these locations. The background sample will be taken from undisturbed native sediment upstream from the percolation bed. The other four locations will be downstream from the percolation bed. Each sampling location will be photographed.

All soil samples will be analyzed to determine the concentrations of total, trivalent, and hexavalent chromium (CrVI). If CrVI concentrations exceed 10 milligrams per kilogram in any sample, an EPA extraction procedure (EP) toxicity test will be performed on the sample.

Sampling Procedures

Fine-grained sediment samples will be obtained from 1 to 3 feet below grade using hand-sampling techniques. Soil samples will be obtained by digging with a stainless steel shovel and stainless steel trowel. The trowel will be used to place soil in paper paint buckets for compositing material passing through a No. 4 (4.75 millimeters) sieve and will be retained for analysis. Two eight-ounce glass jars with Teflon-lined screw caps will be used to retain each sample. Each glass jar will be sealed with tape and placed on ice in a padded cooler. If sampling using a shovel and trowel is not feasible, a hand auger and core sampler will be used. Two-inch-diameter by 6-inch-long brass or plastic tubes, retained by core sampler, will be driven into undisturbed sediment to obtain the sediment samples. Sample tubes will then be removed from the core sampler, the ends visually inspected in the field to classify the materials, and then covered with Teflon film and plastic caps taped to the tube to provide an airtight seal.

At the laboratory, the core samples will be composited immediately prior to analysis. The composited material passing through a No. 4 (4.75 mm) sieve will be retained for analysis.

Each sample will be labeled on site to show the date, project number, sample location, and depth interval. The tape used to seal each sample will be signed by the sampler to ensure sample integrity. The sealed samples will be stored on ice in closed chests, padded, protected from melt water, and delivered to Brown and Caldwell's analytical laboratory in Pasadena or Emeryville within 48 hours of collection.

To prevent cross-contamination of samples, all sampling equipment will be washed with Alconox soap, rinsed with tap water, rinsed with nitric acid, and rinsed two more times with deionized water before initial sampling and after each use. Brass or plastic tubes will be cleaned as described above prior to sampling.

Analytical Methods

Soil samples for total chromium analysis will be digested by EPA Method 3010 and analyzed by EPA Method 7190. Soil samples for hexavalent chromium analysis will be extracted by EPA Method 3060 and analyzed by EPA Method 7196. These methods are described in "Test Methods for Evaluating Solid Waste," EPA publication SW-846. Trivalent chromium concentrations will be determined by subtracting the CrVI concentration from the total chromium concentration.

Reporting

Following receipt of analytical results, a report will be prepared documenting sampling procedures, sample locations, analytical methods, and sampling results. This report will contain recommendations for additional fieldwork if necessary and will be submitted to the DHS by PGandE.

QUALITY ASSURANCE PLAN

The procedures to be followed in sample identification and handling at the PGandE Topock site are described below. Field quality assurance procedures include obtaining duplicate and background soil samples for analysis. The laboratory analytical quality assurance program is also discussed.

Sample Handling

Proper collection and handling are essential in ensuring the quality of the sample. All samples will be collected by experienced field personnel. Glass jars for sample collection will be precleaned at the laboratory. Brass or plastic core sample tubes will be cleaned in the field. The containers will be clearly marked and dated for identification. No holding time has been established for hexavalent chromium in soils; however, the samples will be analyzed within two weeks of receipt at the laboratory.

Sample Identification and Chain-of-Custody Procedures

Sample identification and chain-of-custody procedures ensure sample integrity and document sample possession from the time of collection to its ultimate disposal. Each sample container submitted for analysis will have a label affixed to identify the job number, sampler, date and time of sample collection, and a sample number unique to that sample. This information, in addition to a description of the sample, sampling location, field measurements made, sampling methodology, names of on-site personnel, and any other pertinent field observations, will be recorded on Brown and Caldwell's standard boring log (Figure 3).

A chain-of-custody card (Figure 4) will be used to record possession of the sample from time of collection to its arrival at the laboratory. The sample control officer at the laboratory will verify sample integrity and confirm that it was collected in the proper container, cooled following collection, and that there is an adequate volume for analysis. If these conditions are met, the sample will be assigned a unique log number for identification throughout analysis and reporting. The log number will be recorded on the chain-of-custody card and in the legally required log book Brown and Caldwell maintains at the laboratory. The sample description, date received, client's name, and any other relevant information, will also be recorded.

Laboratory Analytical Quality Assurance

In addition to routine calibration of the instruments with standards and blanks, the analyst is required to run duplicates and spikes on 10 percent of the analyses to ensure an added measure of precision and accuracy. Accuracy is also assured through the following:

1. Certification by DHS.

2. Participation in interlaboratory or round-robin programs.

3. "Blind" samples are submitted by the laboratory's quality assurance officer on a weekly basis. These are prepared from National Bureau of Standards or EPA reference standards.

Miscellaneous Checks of Accuracy

Where trace analysis is involved, purity of the solvents, reagents, and gases employed is of great concern. Brown and Caldwell maintains service contracts on all major instrumentation. Programmable calculations are provided to minimize human error in repetitive calculations.

SAFETY PROGRAM

It is important that the on-site safety program be designed to protect the worker from direct skin contact, inhalation, or ingestion of potentially hazardous materials that may be encountered at the site. It should also familiarize the worker with appropriate first aid procedures in the event of a harmful exposure. The potentially hazardous properties of chromium and their toxic effects are described in the attached materials.

BROWN AND CALDWELL

LOCATION OF BORING

CLIENT

LOCATION | JOB NO.

BORING NO.

SHEET ___ OF ___

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

DRILLING

START	FINISH
TIME	TIME
DATE	DATE

DRILLING CONTRACTOR

DRILLING METHOD

SAMPLING METHOD

N S | E W | ELEV.

SURFACE CONDITIONS

DRILLER ___ RIG ___

BY ___ CHK'D BY ___ DATE ___

WELL CONST. CASING	WELL CONST. ANNULUS	SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLE NO. / SAMPLE DEPTH	BLOWS/6" SAMPLER	DEPTH IN FEET	SOIL CALLOUT	MATERIALS ENCOUNTERED AND DRILLING CONDITIONS
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						5		
						6		
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						8		
						9		
						0		

Figure 3 Brown and Caldwell Boring Log

BROWN AND CALDWELL
BC CONSULTING ENGINEERS

CHAIN OF CUSTODY RECORD

BC Log Number ____________

Client name		Job number
Project name		
Project manager	Sampler(s)	

Sample number	Date sampled	Time sampled	Type Composite or Grab	Sample description	Number of containers	Analyses required							Hazardous sample Special handl'g required	Remarks

Signature	Company	Date	Time
Relinquished by			
Received by			
Relinquished by			
Received by			
Relinquished by			
Received by			

BROWN AND CALDWELL Analytical Laboratories

☐ 1255 Powell Street, Emeryville, CA 94608 (415) 428-2300
☐ 373 South Fair Oaks Avenue, Pasadena, CA 91105 (213) 681-4855

Note: Samples are discarded 30 days after results are reported unless other arrangements are made.
Hazardous samples will be returned to client or disposed of at client expense.

Figure 4 Brown and Caldwell Chain-of-Custody Record

Personnel Protection

The personnel protection plan for this project is designed to prevent sampling personnel from exposure to heavy metals.

To prevent direct skin contact, the following protective clothing will be worn while collecting the samples:

1. Hard hat with optional face shield.
2. Breathable Tyvek coveralls or cotton coveralls.
3. Disposable vinyl gloves, changed between samples.
4. Neoprene boots with steel toe.
5. Goggles to guard against splash unless face shield is used.

If there is significant dust observed during the sampling operations, dust masks will be worn.

No eating, drinking, or smoking will be allowed in the vicinity of the sampling operations. No contact lenses will be worn by sampling personnel.

Procedures

Personal protective equipment shall be donned before sampling. The sleeves of the coveralls shall be outside of the cuffs of the gloves to facilitate removal of clothing with the least contamination to personnel. If at any time the protective clothing (coveralls, boots, or gloves) become wet or contaminated, they will be removed immediately.

Decontamination Procedures

At the end of the workday, the following procedures will be used to allow for the safe removal and decontamination of protective equipment:

1. Boots will be washed with Alconox and tap water, then rinsed before removal.

2. Boots and coveralls will be removed before the gloves are removed.

3. Disposable clothing will be placed in plastic bags for disposal by PGandE.

4. Gloves will then be removed and hands washed with soap and water.

First Aid

On-site personnel will be informed of the symptoms related to heat exhaustion, which include pale and clammy skin, muscle cramps, weakness, nausea, dizziness, and profuse perspiration. Symptoms of heat stroke include reddish skin, no perspiration, high body temperature, and strong, rapid pulse. In the event that any on-site personnel experience the above symptoms, sampling operations will be stopped and medical attention will be obtained as necessary.

Heat Exhaustion. First aid is:

1. Loosen clothing.
2. Lie down and elevate feet.
3. Cool body with fan, damp towels, air conditioning.
4. Sip salt water (1 teaspoon salt/8 ounces water/1/2 hour).

Heat Stroke: First aid is:

1. Loosen clothing.
2. Cool body with fan, damp towels, air conditioning.

Metals Exposure: First aid is:

Direct Contact

Skin--remove clothing if contaminated and promptly wash affected area with soap and water.

Eyes--hold the eyelid open and flush with ample amounts of water.

Inhalation

Remove the person to fresh air immediately; give artificial respiration as necessary.

Line of Authority

The on-site Brown and Caldwell hydrogeologist has authority to ensure that safety equipment and procedures employed are consistent with this work plan and by the direction of the project manager.

Emergency Services

The following emergency numbers apply to the Needles area where site work will be conducted:

Fire: (619) 326-3211
Police: (619) 326-2111

APPENDIX A

Casarett and Doull. Toxicology, The Basic Science of Poisons. Second Edition.

Hawley, Gessner G. The Condensed Chemical Dictionary. Tenth Edition.

CASARETT AND DOULL'S
TOXICOLOGY
The Basic Science of Poisons
SECOND EDITION

EDITORS
John Doull, M.D., Ph.D.
Curtis D. Klaassen, Ph.D.
Mary O. Amdur, Ph.D.

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nizing rubber. All
orane is the most

hazardous. Diborane is an irritant to the lungs and kidneys. Decaborane and pentaborane are central nervous system poisons; however, the liver and kidneys may also be damaged if the exposure is severe (Browning, 1969).

CESIUM

Occurrence and Use. Cesium occurs in nature as pollucite, a hydrous cesium-aluminum silicate. Its main industrial uses are as a catalyst in the polymerization of resin-forming materials and in photoelectric cells. It is useful in this respect because the range of sensitivity is approximately that of the human eye. Radioactive cesium is a constituent of nuclear fallout.

Absorption, Excretion, Toxicity. Cesium is absorbed after oral administration and is bound within the cells of the soft tissues such as kidney and muscle. It is found in the red blood cells and may in some circumstances be able to replace potassium. The urine is the main route of excretion. Increased potassium levels facilitate cesium excretion. The radioactive material is found in milk.

No cases of industrial injury related to the chemical toxicity of cesium have been reported. It is likely that replacement of potassium by cesium would produce ill effects in man, probably neuromuscular in nature, as has been demonstrated in experimental animals (Browning, 1969).

CHROMIUM

Occurrence and Use. Chromite ($FeCr_2O_4$) is the most important chrome ore. Chromium plating is one of the major uses of this metal. Steel fabrication, paint and pigment manufacturing, and leather tanning constitute other major uses of chromium. The medicinal uses of chromium are limited to external application of chromium trioxide as a caustic and intravenous sodium radiochromate to evaluate the life-span of red cells.

Absorption, Excretion, Toxicity. Chromium exists in several valence states. Only the trivalent and hexavalent are biologically significant. While conversion from trivalent to hexavalent and other states is important chemically, the inner conversion from chromic to chromate does not apparently occur biologically. The conversion of hexavalent to trivalent does take place in the body.

Trivalent chromium is an essential element in animals. It plays a role in glucose and lipid metabolism. Chromium deficiency mimics diabetes mellitus and produces aortic plaques in rats. Chromium supplementation improves or normalizes glucose tolerance in diabetics, older people, and malnourished children. It has been suggested that chromium deficiency may be a basic factor in atherosclerosis (Mertz, 1969; Schroeder *et al.*, 1970c). A deficiency of trivalent chromium apparently increases the toxicity of lead (Schroeder *et al.*, 1965).

The major environmental exposure to chromium occurs as a consequence of its presence in food. Brown sugar and animal fats, especially butter, are chromium-rich foods. Chromium is found in urban air (Table 17-3). The concentration in natural water supplies is below 10 ppb; however, in municipal drinking water concentrations of 35 ppb have been reported (Table 17-2). The daily intake has been estimated at 60 μg (30 to 100 μg), 10 μg of which is due to water concentrations (Table 17-1). However, the absorption is limited to approximately 1 percent (Schroeder *et al.*, 1962b). The occurrence of chromium in food or water has not been shown to produce any significant adverse effects in either man or experimental animals (U.S. Public Health Service, 1962; Kanisawa and Schroeder, 1969; Schroeder and Mitchener, 1971).

The total chromium body burden of man has been estimated at less than 6 mg (Table 17-1). Chromium is transported across the placenta and concentrated in the fetus. The tissue concentrations tend to decline rapidly with age except for the lung concentration, which tends to increase. The decline of chromium levels with age does not occur in rats. Wide geographic variations in tissue concentration, presumably due to differences in dietary intake and atmospheric concentration, have been reported (Schroeder *et al.*, 1970d).

Water-soluble chromates disappear from the lungs into the circulatory system after intratracheal application, while the trivalent chromic chloride remains largely in the lungs. Oral administration of trivalent chromium results in little chromium absorption. The degree of absorption is slightly higher following administration of hexavalent compounds. Once absorbed, Cr^{3+} is bound to the plasma proteins. Under normal conditions the body contains stores of chromium in the skin, lungs, muscle, and fat. The bone contains chromium, but this is not due to selective deposition. The caudate nucleus has been reported to have high concentrations. Hexavalent chromium is reduced to the trivalent form in the skin. In the blood little hexavalent chromium can be detected. The reticuloendothelial system, liver, spleen, testes, and bone marrow have an affinity for chromite, possibly as the result of phagocytosis of colloidal particles formed at higher tissue concentrations. On the other hand, chromates are bound largely to the red blood cells. Subcellular distribution studies have indicated that the nuclear fraction contains almost one-half the intracellular chromium. Urinary excretion accounts for about 80 percent of injected chromium. However, elimination via the intestine may also play a role in chromium excretion. Milk is another secondary route of excretion (Mertz, 1969). Average urinary and blood concentrations are 0.4 and 2.8 μg/100 g, respectively (Imbus *et al.*, 1963).

Occupational exposure to chromium compounds (Cr^{6+}) causes dermatitis, penetrating ulcers on the hands and forearms, perforation of the nasal septum, and inflammation of the larynx and liver. The dermatitis is probably due to an allergenic response, although persons sensitive to Cr^{6+} also respond to large amounts of Cr^{3+} (Fregert and Rossman, 1964). The ulcers are believed to be due to chromate ion and not related to sensitization. Chromic acid, and, to a lesser extent, chromate, are presumably the causative agents in perforation of the nasal septum (Browning, 1969). Epidemiologic studies indicate that chromate is a carcinogen with bronchogenic carcinoma as the principal lesion. The latent period appears to be 10 to 15 years. The relative risk of chromate plant workers for respiratory cancer is 20 times greater than that of the general population. Experimental studies have suggested that calcium chromate may be the specific carcinogenic agent (Enterline, 1974). However, some investigators have produced cancer in experimental animals with injections of either the trivalent or hexavalent form (Hueper and Payne, 1962). Incorporation of hexavalent chromium (5 ppm) into the drinking water of mice over their lifetimes produced a slightly higher incidence of malignant tumors than in the controls. Trivalent chromium (chromium acetate) given to rats under similar conditions produced no such effect (Schroeder and Mitchner, 1971; Kanisawa and Schroeder, 1969).

COBALT

Occurrence and Use. Cobalt is a relatively rare metal produced primarily as a by-product of other metals, chiefly copper. It is used in high-temperature alloys and in permanent magnets. Its salts are useful in paint driers, as catalysts, and in the production of numerous pigments. It is an essential element in that 1 μg of vitamin B_{12} contains 0.0434 μg of cobalt. Vitamin B_{12} is essential in the prevention of pernicious anemia. If other requirements exist, they are not well understood. Deficiency diseases of cattle and sheep caused by insufficient natural levels of cobalt are characterized by anemia and loss of weight or retarded growth.

Absorption, Excretion, Toxicity. Cobalt salts are generally well absorbed after oral ingestion, probably in the jejunum. Despite this fact, increased levels tend not to cause significant accumulation. About 80 percent of the ingested cobalt is excreted in the urine. Of the remaining, about 15 percent is excreted in the feces by an enterohepatic pathway, while the milk and sweat are other secondary routes of excretion. The total body burden has been estimated as 1.1 mg. The muscle contains the largest total fraction, but the fat has the highest concentration. The liver, heart, and hair have significantly higher concentrations than other organs, but the concentration in these organs is relatively low. The normal levels in human urine and blood are about 98 and 0.18 μg/l, respectively. The blood level is largely in association with the red cells.

Significant species differences have been observed in the excretion of radiocobalt. In rats and cattle 80 percent is eliminated in the feces (Schroeder *et al.*, 1967b).

Polycythemia is the characteristic response of most mammals, including man, to ingestion of excessive amounts of cobalt. Toxicity resulting from overzealous therapeutic administration has been reported to produce vomiting, diarrhea, and a sensation of warmth. Intravenous administration leads to flushing of the face, increased blood pressure, slowed respiration, giddiness, tinnitus, and deafness due to nerve damage (Browning, 1969).

High levels of chronic oral administration may result in the production of goiter. Epidemiologic studies suggest that the incidence of goiter is higher in regions containing increased levels of cobalt in the water and soil (Wills, 1966). The goitrogenic effect has been elicited by the oral administration of 3 to 4 mg/kg to children in the course of sickle cell anemia therapy (Browning, 1969).

Cardiomyopathy has been caused by excessive intake of cobalt, particularly in beer to which cobalt was added to enhance its foaming qualities. The onset of the poisoning occurred about one month after cobalt was added in concentrations of 1 ppm. Why such a low concentration should produce this effect in the absence of any similar change when cobalt is used therapeutically is unknown. The signs and symptoms were those of congestive heart failure. Autopsy findings revealed a tenfold increase in the cardiac levels of cobalt. Alcohol may have served to potentiate the effect of the cobalt (Morin and Daniel, 1967).

Hyperglycemia due to alpha cell pancreatic damage has been reported after injection into rats. Reduction of blood pressure has also been observed in rats after injection and has led to some experimental use in man (Schroeder *et al.*, 1967b).

THE CONDENSED CHEMICAL DICTIONARY

TENTH EDITION

Revised by

GESSNER G. HAWLEY

gh purity (CrF₃).
ating to skin and eyes, especially
nce. 0.5 mg per cubic meter of air.
dyeing woolens; mothproofing;
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el.

(chromic hydrate; chromium hy-
n hydrate) $Cr(OH)_3$.
gelatinous precipitate; decom-
oxide by heat. Insoluble in water;
d strong alkalies.
ding a solution of ammonium
olution of a chromium salt.
en; catalyst; tanning agent; mor-

romium nitrate) $Cr(NO_3)_3 \cdot 9H_2O$.
crystals; soluble in alcohol and
decomposes 100° C.
ction of nitric acid on chromium

idant; toxic; may ignite organic
tact. May be explosive when

osion inhibitor.
ns: Nitrates, n.o.s., (Rail, Air)

romium oxide; chromia; chro-
green cinnabar) Cr_2O_3.
green, extremely hard crystals; sp.
35° C; b.p. 4000° C; insoluble in
kalies.
eating chromium hydroxide; (b)
ammonium dichromate; (c) by
chromate with sulfur and washing
ate.
gestion and inhalation. A known
nce. 0.5 mg per cubic meter of air.
green paint pigment; ceramics;
c synthesis; green granules in
omponent of refractory brick;

(chromium phosphate)
(b) $CrPO_4 \cdot 4H_2O$.
t crystals; sp. gr. 2.12 (14° C); (b)
uble in acids; insoluble in water.
raction of solutions of chromium
dium phosphate; (b) by mixing
disodium hydrogen phosphate.
powder (not the hexahydrate) is
comes crystalline on contact with
it is converted into green crystal-

catalyst.

chromium sulfate) (a) $Cr_2(SO_4)_3$;
H_2O; (c) $Cr_2(SO_4)_3 \cdot 18H_2O$.
rt or red powder; (b) dark-green
(c) violet cubes. Sp. gr. (a) 3.012;

(b) 1.867; (c) 1.70. (a) Insoluble in water and acids; (b) soluble in water; insoluble in alcohol. (c) soluble in water and alcohol.

Derivation: Action of sulfuric acid on chromium hydroxide, with subsequent crystallization.

Uses: Chrome plating; chromium alloys; mordant; catalyst; green paints and varnishes; green ink; ceramics (glazes). The basic form (reduction of sodium dichromate) is used in tanning (q.v.).

chromite (chrome iron ore) $FeCr_2O_4$. A natural oxide of ferrous iron and chromium, sometimes with magnesium and aluminum present. Usually occurs in magnesium- and iron-rich igneous rocks.
Properties: Color iron-black to brownish-black; streak dark brown; luster metallic to submetallic; sp. gr. 4.6; Mohs hardness 5.5.
Grades: Metallurgical; refractory; chemical.
Occurrence: U.S.S.R.; So. Africa; Zimbabwe; Philippines; Cuba; Turkey.
Hazard: A known carcinogen. Tolerance, 0.05 mg/cubic meter of air.
Uses: Only commercial source of chromium and its compounds.

chromium Cr Metallic element of atomic number 24, group VIB of the Periodic Table; atomic weight 51.996; valences 2, 3, 6; four stable isotopes. Name derived from Greek for color.
Properties: Hard, brittle, semi-gray metal. Sp. gr. 7.1; m.p. 1900° C; b.p. 2200° C. Compounds have strong and varied colors. Cr ion forms many coordination compounds. Exists in active and passive forms, the latter giving rise to its corrosion resistance, due to a thin surface oxide layer that passivates the metal when treated with oxidizing agents. Active form reacts readily with dilute acids to form chromous salts. Soluble in acids (except nitric) and strong alkalies; insoluble in water.
Occurrence: USSR, So. Africa, Turkey, Philippines, Zimbabwe; Cuba.
Derivation: From chromite (q.v.), by direct reduction (ferrochrome); by reducing the oxide with finely divided aluminum or carbon; and by electrolysis of chromium solutions.
Grades: (ore): Chromium ores are classified as (1) metallurgical, (2) refractory, and (3) chemical, and their consumption in the U.S. is in that order. (1) must contain a minimum of 48% Cr_2O_3 and have chromium-iron ratio of 3 to 1; (2) must be high in Cr_2O_3 and Al_2O_3 and low in iron; (3) must be low in SiO_2 and Al_2O_3 and high in Cr_2O_3.
Forms available: (1) Chromium metal as lumps, granules, or powder; (2) high- or low-carbon ferrochromium (q.v.). (3) Single crystals. High-purity crystals or powder run 99.97% pure.
Hazard: Hexavalent chromium compounds have an irritating and corrosive effect on tissue, resulting in ulcers and dermatitis on prolonged contact. Tolerance for chromium dust and fume is 0.5 mg per cubic meter of air. It is a known carcinogen (OSHA).
Uses: Alloying and plating element on metal and plastic substrates for corrosion resistance; chromium-containing and stainless steels; protective coating for automotive and equipment accessories; nuclear and high-temperature research; constituent of inorganic pigments.

chromium 51. Radioactive chromium of mass number 51.
Properties: Half-life 26.5 days; radiation, gamma (0.32 MeV).
Grade: U.S.P. (as sodium chromate Cr 51 injection).
Hazard: Radioactive poison.
Uses: Diagnosis of blood volume (as tracer).
Shipping regulations: (Rail, Air) Consult regulations.

chromium acetate. See chromic acetate.

chromium acetylacetonate
$[CH_3COCHC(CH_3)O]_3Cr$.
Properties: Purple powder or red-violet crystals; m.p. 216° C; b.p. 340° C, insoluble in water; soluble in acetone and alcohol.
Derivation: Reaction of chromium chloride, acetylacetone and sodium carbonate.
Use: Reduction of detonation of nitromethane.

chromium ammonium sulfate (ammonium chromium sulfate; chrome ammonium alum)
$CrNH_4(SO_4)_2 \cdot 12H_2O$.
Properties: Green powder or deep violet crystals; sp. gr. 1.72; m.p. 94° C. Soluble in water; slightly soluble in alcohol. The aqueous solution is violet when cold; green when hot.
Grades: Technical.
Uses: Mordant; tanning.

chromium boride One of several compounds of chromium and boron, e.g., CrB, CrB_2, and Cr_3B_4. They have high melting points, are very hard and corrosion-resistant, and may be suitable for use in jet and rocket engines.
Properties: CrB, may be crystalline; sp. gr. 6.2; m.p. 1550° C; Mohs hardness 8.5; resistivity 67μ-ohm cm (20° C). CrB_2, sp. gr. 5.15; m.p. 1850° C; hardness 2010 (Knoop); resists oxidation up to 1100° C. Cr_3B_4, may be crystalline; sp. gr. 6.1; Mohs hardness 9+;
Uses: Metallurgical additives; high temperature electrical conductors; cermets; refractories; coatings resistant to attack by molten metals.

chromium bromide. See chromous bromide.

chromium carbide Cr_3C_2.
Properties: Orthorhombic crystals; sp. gr. 6.65; microhardness, 2700 kg/sq mm (load 50 g); m.p. 1890° C; b.p. 3800° C; resistivity 95μ-ohm cm (room temperature). Highest oxidation resistance at high temperatures of all metal carbides; also resistant to acids and alkalies.
Uses: Gage blocks and hot extrusion dies; in powder form, as spray coating material; components for pumps and valves.

ATTACHMENT 1

BROWN AND CALDWELL

CONSULTING ENGINEERS

PHONE MEMO

TO: Vitale DATE: 10/5 TIME: 9:25 AM / PM

FROM: Sue Chacmoky

OF: PG&E

AREA CODE NO.: 415-972-[illegible]34 EXT.

MESSAGE:

Call Back on
Morning 10-11-88
Tuesday
(Contractor problems)

SIGNED: jcm

PHONED [X] CALL BACK [X] RETURNED CALL [ ] WANTS TO SEE YOU [ ] WILL CALL AGAIN [ ] WAS IN [ ] URGENT [ ]

SEDIMENT SAMPLING AND ANALYSIS PLAN FOR PERCOLATION BED AND BAT CAVE WASH

TOPOCK COMPRESSOR STATION
PACIFIC GAS AND ELECTRIC COMPANY

SEPTEMBER 1986

BROWN AND CALDWELL
PLEASANT HILL, CALIFORNIA

BROWN AND CALDWELL
CONSULTING ENGINEERS

September 12, 1986

Mr. Salem Attiga
Gas System Design Department
Pacific Gas and Electric Company
77 Beale Street, Room 2892
San Francisco, California 94106

11-39-2339-08/1

Subject: Sediment Sampling and Analysis Plan for Percolation Bed and Bat Cave Wash, Topock Gas Compressor Station

Dear Mr. Attiga:

Brown and Caldwell is pleased to submit this sampling and analysis plan for soil sampling of the Percolation Bed and Bat Cave Wash at the Topock Gas Compressor Station. This plan addresses the intent of the January 1986 plan prepared by the California Department of Health Services. If you have any questions please call Glen Wyatt.

Very truly yours,

BROWN AND CALDWELL

Brian D. Bracken

Brian D. Bracken
Vice President

Glen M. Wyatt

Glen M. Wyatt
Project Manager
Registered Geologist No. 4053

GMW:ljs

cc: Steven A. Fisher, Brown and Caldwell

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LIST OF FIGURES

SEDIMENT SAMPLING AND ANALYSIS PLAN FOR PERCOLATION BED AND BAT CAVE WASH, TOPOCK GAS COMPRESSOR STATION

This sampling and analysis plan has been prepared in order to satisfy a January 1986 request by the California Department of Health Services (DHS) for information concerning Pacific Gas and Electric Company's (PGandE) possible chromium contamination of soils in Bat Cave Wash at Topock Gas Compressor Station. This plan is based on a U.S. Environmental Protection Agency/DHS sampling plan dated January 1986 which was sent to PGandE. The following sections of this plan describe the sampling and analysis of sediments within Bat Cave Wash to determine if chromium is present in the sediments.

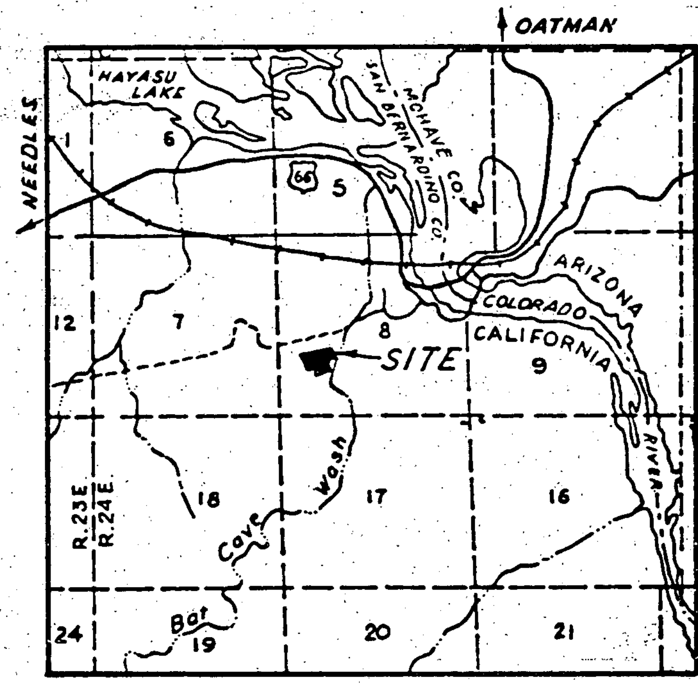
Background

The Topock Compressor Station is located 15 miles southeast of Needles, California (Figure 1). Two cooling towers provide for cooling of natural gas which is compressed at the station and for cooling of lubricating oil used in the compressor engines. Until October 1985, a chromium-based corrosion inhibitor was added to the cooling tower to prevent corrosion of the heat exchanger bundles and the cooling tower structures. In October 1985, this corrosion inhibitor was replaced by a nonhazardous phosphate-based corrosion inhibitor.

From 1951 to 1969, cooling tower wastewater containing chromium was discharged to a percolation bed in Bat Cave Wash (Figure 2). Bat Cave Wash trends north-south through the property and drains to the Colorado River to the north. Except during seasonal storms, the wash is dry.

Rationale

The purpose of this soil sampling is to document chromium concentrations in soils within the former percolation beds and to determine if chromium has migrated from the percolation beds. Four sample locations will be within the percolation bed area to quantify chromium concentrations within the former disposal area. Four soil samples within Bat Cave Wash downstream from the percolation bed will be used to determine if chromium has migrated from the percolation bed area. One soil sample will be obtained upstream from the percolation bed to identify background chromium concentrations.



SCALE: 1" = 1 MILE

Figure 1 Vicinity Map

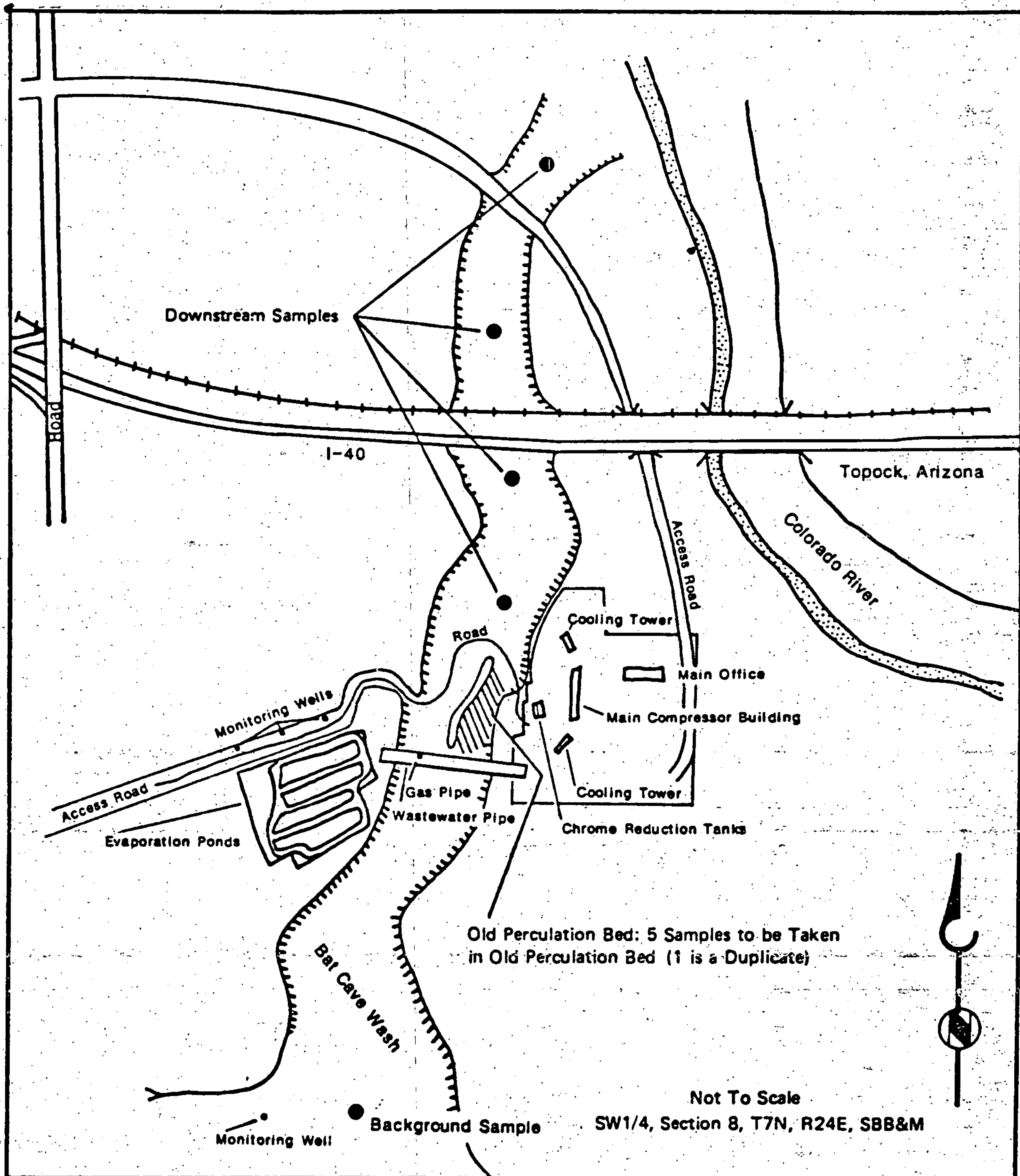


Figure 2 Sampling Locations, Bat Cave Wash, Topock Compressor Station

Sampling

Ten sediment samples, including one duplicate and one background sample, will be collected from the nine locations shown on Figure 2. Four locations will be within the old percolation beds and a duplicate soil sample will be obtained at one of these locations. The background sample will be taken from undisturbed native sediment upstream from the percolation bed. The other four locations will be downstream from the percolation bed. Each sampling location will be photographed.

All soil samples will be analyzed to determine the concentrations of total, trivalent, and hexavalent chromium (CrVI). If CrVI concentrations exceed 10 milligrams per kilogram in any sample, an EPA extraction procedure (EP) toxicity test will be performed on the sample.

Sampling Procedures

Fine-grained sediment samples will be obtained from 1 to 3 feet below grade using hand-sampling techniques. Soil samples will be obtained by digging with a stainless steel shovel and stainless steel trowel. The trowel will be used to place soil in paper paint buckets for compositing material passing through a No. 4 (4.75 millimeters) sieve and will be retained for analysis. Two eight-ounce glass jars with Teflon-lined screw caps will be used to retain each sample. Each glass jar will be sealed with tape and placed on ice in a padded cooler. If sampling using a shovel and trowel is not feasible, a hand auger and core sampler will be used. Two-inch-diameter by 6-inch-long brass or plastic tubes, retained by core sampler, will be driven into undisturbed sediment to obtain the sediment samples. Sample tubes will then be removed from the core sampler, the ends visually inspected in the field to classify the materials, and then covered with Teflon film and plastic caps taped to the tube to provide an airtight seal.

At the laboratory, the core samples will be composited immediately prior to analysis. The composited material passing through a No. 4 (4.75 mm) sieve will be retained for analysis.

Each sample will be labeled on site to show the date, project number, sample location, and depth interval. The tape used to seal each sample will be signed by the sampler to ensure sample integrity. The sealed samples will be stored on ice in closed chests, padded, protected from melt water, and delivered to Brown and Caldwell's analytical laboratory in Pasadena or Emeryville within 48 hours of collection.

To prevent cross-contamination of samples, all sampling equipment will be washed with Alconox soap, rinsed with tap water, rinsed with nitric acid, and rinsed two more times with deionized water before initial sampling and after each use. Brass or plastic tubes will be cleaned as described above prior to sampling.

Analytical Methods

Soil samples for total chromium analysis will be digested by EPA Method 3010 and analyzed by EPA Method 7190. Soil samples for hexavalent chromium analysis will be extracted by EPA Method 3060 and analyzed by EPA Method 7196. These methods are described in "Test Methods for Evaluating Solid Waste," EPA publication SW-846. Trivalent chromium concentrations will be determined by subtracting the CrVI concentration from the total chromium concentration.

Reporting

Following receipt of analytical results, a report will be prepared documenting sampling procedures, sample locations, analytical methods, and sampling results. This report will contain recommendations for additional fieldwork if necessary and will be submitted to the DHS by PGandE.

QUALITY ASSURANCE PLAN

The procedures to be followed in sample identification and handling at the PGandE Topock site are described below. Field quality assurance procedures include obtaining duplicate and background soil samples for analysis. The laboratory analytical quality assurance program is also discussed.

Sample Handling

Proper collection and handling are essential in ensuring the quality of the sample. All samples will be collected by experienced field personnel. Glass jars for sample collection will be precleaned at the laboratory. Brass or plastic core sample tubes will be cleaned in the field. The containers will be clearly marked and dated for identification. No holding time has been established for hexavalent chromium in soils; however, the samples will be analyzed within two weeks of receipt at the laboratory.

Sample Identification and Chain-of-Custody Procedures

Sample identification and chain-of-custody procedures ensure sample integrity and document sample possession from the time of collection to its ultimate disposal. Each sample container submitted for analysis will have a label affixed to identify the job number, sampler, date and time of sample collection, and a sample number unique to that sample. This information, in addition to a description of the sample, sampling location, field measurements made, sampling methodology, names of on-site personnel, and any other pertinent field observations, will be recorded on Brown and Caldwell's standard boring log (Figure 3).

A chain-of-custody card (Figure 4) will be used to record possession of the sample from time of collection to its arrival at the laboratory. The sample control officer at the laboratory will verify sample integrity and confirm that it was collected in the proper container, cooled following collection, and that there is an adequate volume for analysis. If these conditions are met, the sample will be assigned a unique log number for identification throughout analysis and reporting. The log number will be recorded on the chain-of-custody card and in the legally required log book Brown and Caldwell maintains at the laboratory. The sample description, date received, client's name, and any other relevant information, will also be recorded.

Laboratory Analytical Quality Assurance

In addition to routine calibration of the instruments with standards and blanks, the analyst is required to run duplicates and spikes on 10 percent of the analyses to ensure an added measure of precision and accuracy. Accuracy is also assured through the following:

1. Certification by DHS.

2. Participation in interlaboratory or round-robin programs.

3. "Blind" samples are submitted by the laboratory's quality assurance officer on a weekly basis. These are prepared from National Bureau of Standards or EPA reference standards.

Miscellaneous Checks of Accuracy

Where trace analysis is involved, purity of the solvents, reagents, and gases employed is of great concern. Brown and Caldwell maintains service contracts on all major instrumentation. Programmable calculations are provided to minimize human error in repetitive calculations.

SAFETY PROGRAM

It is important that the on-site safety program be designed to protect the worker from direct skin contact, inhalation, or ingestion of potentially hazardous materials that may be encountered at the site. It should also familiarize the worker with appropriate first aid procedures in the event of a harmful exposure. The potentially hazardous properties of chromium and their toxic effects are described in the attached materials.

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LOCATION OF BORING	CLIENT				BORING NO.
	LOCATION		JOB NO.		
	WATER LEVEL				SHEET
					OF
	TIME				DRILLING
	DATE				START / FINISH
	CASING DEPTH				TIME / TIME
	DRILLING CONTRACTOR				
	DRILLING METHOD				DATE / DATE
	SAMPLING METHOD				

DRILLER ______ RIG ______

BY ______ CHK'D BY ______ DATE ______

WELL CONST. CASING	WELL CONST. ANNULUS	SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLE NO. / SAMPLE DEPTH	BLOWS/6" SAMPLER	DEPTH IN FEET	SOIL CALLOUT	N S / E W / ELEV. — SURFACE CONDITIONS — MATERIALS ENCOUNTERED AND DRILLING CONDITIONS
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

Figure 3 Brown and Caldwell Boring Log

BROWN AND CALDWELL CONSULTING ENGINEERS

CHAIN OF CUSTODY RECORD

BC Log Number ______________

Client name	Job number
Project name	
Project manager	Sampler(s)

Sample number	Date sampled	Time sampled	Type Composite or Grab	Sample description	Number of containers	Analyses required							Hazardous sample Special handling required	Remarks

Signature	Company	Date	Time
Relinquished by			
Received by			
Relinquished by			
Received by			
Relinquished by			
Received by			

BROWN AND CALDWELL Analytical Laboratories

☐ 1255 Powell Street, Emeryville, CA 94603 (415) 428-2300
☐ 373 South Fair Oaks Avenue, Pasadena, CA 91105 (213) 681-4855

Note: Samples are discarded 30 days after results are reported unless other arrangements are made.
Hazardous samples will be returned to client or disposed of at client expense.

Figure 4 Brown and Caldwell Chain-of-Custody Record

Personnel Protection

The personnel protection plan for this project is designed to prevent sampling personnel from exposure to heavy metals.

To prevent direct skin contact, the following protective clothing will be worn while collecting the samples:

1. Hard hat with optional face shield.
2. Breathable Tyvek coveralls or cotton coveralls.
3. Disposable vinyl gloves, changed between samples.
4. Neoprene boots with steel toe.
5. Goggles to guard against splash unless face shield is used.

If there is significant dust observed during the sampling operations, dust masks will be worn.

No eating, drinking, or smoking will be allowed in the vicinity of the sampling operations. No contact lenses will be worn by sampling personnel.

Procedures

Personal protective equipment shall be donned before sampling. The sleeves of the coveralls shall be outside of the cuffs of the gloves to facilitate removal of clothing with the least contamination to personnel. If at any time the protective clothing (coveralls, boots, or gloves) become wet or contaminated, they will be removed immediately.

Decontamination Procedures

At the end of the workday, the following procedures will be used to allow for the safe removal and decontamination of protective equipment:

1. Boots will be washed with Alconox and tap water, then rinsed before removal.

2. Boots and coveralls will be removed before the gloves are removed.

3. Disposable clothing will be placed in plastic bags for disposal by PGandE.

4. Gloves will then be removed and hands washed with soap and water.

First Aid

On-site personnel will be informed of the symptoms related to heat exhaustion, which include pale and clammy skin, muscle cramps, weakness, nausea, dizziness, and profuse perspiration. Symptoms of heat stroke include reddish skin, no perspiration, high body temperature, and strong, rapid pulse. In the event that any on-site personnel experience the above symptoms, sampling operations will be stopped and medical attention will be obtained as necessary.

Heat Exhaustion. First aid is:

1. Loosen clothing.
2. Lie down and elevate feet.
3. Cool body with fan, damp towels, air conditioning.
4. Sip salt water (1 teaspoon salt/8 ounces water/1/2 hour).

Heat Stroke: First aid is:

1. Loosen clothing.
2. Cool body with fan, damp towels, air conditioning.

Metals Exposure: First aid is:

Direct Contact

Skin--remove clothing if contaminated and promptly wash affected area with soap and water.

Eyes--hold the eyelid open and flush with ample amounts of water.

Inhalation

Remove the person to fresh air immediately; give artificial respiration as necessary.

Line of Authority

The on-site Brown and Caldwell hydrogeologist has authority to ensure that safety equipment and procedures employed are consistent with this work plan and by the direction of the project manager.

Emergency Services

The following emergency numbers apply to the Needles area where site work will be conducted:

Fire: (619) 326-3211
Police: (619) 326-2111

APPENDIX A

Casarett and Doull. Toxicology, The Basic Science of Poisons. Second Edition.

Hawley, Gessner G. The Condensed Chemical Dictionary. Tenth Edition.

CASARETT AND DOULL'S

TOXICOLOGY

The Basic Science of Poisons

SECOND EDITION

EDITORS

John Doull, M.D., Ph.D.

Curtis D. Klaassen, Ph.D.

Mary O. Amdur, Ph.D.

hazardous. Diborane is an irritant to the lungs and kidneys. Decaborane and pentaborane are central nervous system poisons; however, the liver and kidneys may also be damaged if the exposure is severe (Browning, 1969).

CESIUM

Occurrence and Use. Cesium occurs in nature as pollucite, a hydrous cesium-aluminum silicate. Its main industrial uses are as a catalyst in the polymerization of resin-forming materials and in photoelectric cells. It is useful in this respect because the range of sensitivity is approximately that of the human eye. Radioactive cesium is a constituent of nuclear fallout.

Absorption, Excretion, Toxicity. Cesium is absorbed after oral administration and is bound within the cells of the soft tissues such as kidney and muscle. It is found in the red blood cells and may in some circumstances be able to replace potassium. The urine is the main route of excretion. Increased potassium levels facilitate cesium excretion. The radioactive material is found in milk.

No cases of industrial injury related to the chemical toxicity of cesium have been reported. It is likely that replacement of potassium by cesium would produce ill effects in man, probably neuromuscular in nature, as has been demonstrated in experimental animals (Browning, 1969).

CHROMIUM

Occurrence and Use. Chromite ($FeCr_2O_4$) is the most important chrome ore. Chromium plating is one of the major uses of this metal. Steel fabrication, paint and pigment manufacturing, and leather tanning constitute other major uses of chromium. The medicinal uses of chromium are limited to external application of chromium trioxide as a caustic and intravenous sodium radiochromate to evaluate the life-span of red cells.

Absorption, Excretion, Toxicity. Chromium exists in several valence states. Only the trivalent and hexavalent are biologically significant. While conversion from trivalent to hexavalent and other states is important chemically, the inner conversion from chromic to chromate does not apparently occur biologically. The conversion of hexavalent to trivalent does take place in the body.

Trivalent chromium is an essential element in animals. It plays a role in glucose and lipid metabolism. Chromium deficiency mimics diabetes mellitus and produces aortic plaques in rats. Chromium supplementation improves or normalizes glucose tolerance in diabetics, older people, and malnourished children. It has been suggested that chromium deficiency may be a basic factor in atherosclerosis (Mertz, 1969; Schroeder *et al.*, 1970c). A deficiency of trivalent chromium apparently increases the toxicity of lead (Schroeder *et al.*, 1965).

The major environmental exposure to chromium occurs as a consequence of its presence in food. Brown sugar and animal fats, especially butter, are chromium-rich foods. Chromium is found in urban air (Table 17-3). The concentration in natural water supplies is below 10 ppb; however, in municipal drinking water concentrations of 35 ppb have been reported (Table 17-2). The daily intake has been estimated at 60 μg (30 to 100 μg), 10 μg of which is due to water concentrations (Table 17-1). However, the absorption is limited to approximately 1 percent (Schroeder *et al.*, 1962b). The occurrence of chromium in food or water has not been shown to produce any significant adverse effects in either man or experimental animals (U.S. Public Health Service, 1962; Kanisawa and Schroeder, 1969; Schroeder and Mitchener, 1971).

The total chromium body burden of man has been estimated at less than 6 mg (Table 17-1). Chromium is transported across the placenta and concentrated in the fetus. The tissue concentrations tend to decline rapidly with age except for the lung concentration, which tends to increase. The decline of chromium levels with age does not occur in rats. Wide geographic variations in tissue concentration, presumably due to differences in dietary intake and atmospheric concentration, have been reported (Schroeder *et al.*, 1970d).

Water-soluble chromates disappear from the lungs into the circulatory system after intratracheal application, while the trivalent chromic chloride remains largely in the lungs. Oral administration of trivalent chromium results in little chromium absorption. The degree of absorption is slightly higher following administration of hexavalent compounds. Once absorbed, Cr^{3+} is bound to the plasma proteins. Under normal conditions the body contains stores of chromium in the skin, lungs, muscle, and fat. The bone contains chromium, but this is not due to selective deposition. The caudate nucleus has been reported to have high concentrations. Hexavalent chromium is reduced to the trivalent form in the skin. In the blood little hexavalent chromium can be detected. The reticuloendothelial system, liver, spleen, testes, and bone marrow have an affinity for chromite, possibly as the result of phagocytosis of colloidal particles formed at higher tissue concentrations. On the other hand, chromates are bound largely to the red blood cells. Subcellular distribution studies have indicated that the nuclear fraction contains almost one-half the intracellular chromium. Urinary excretion accounts for about 80 percent of injected chromium. However, elimination via the intestine may also play a role in chromium excretion. Milk is another secondary route of excretion (Mertz, 1969). Average urinary and blood concentrations are 0.4 and 2.8 $\mu g/100$ g, respectively (Imbus *et al.*, 1963).

Occupational exposure to chromium compounds (Cr^{6+}) causes dermatitis, penetrating ulcers on the hands and forearms, perforation of the nasal septum, and inflammation of the larynx and liver. The dermatitis is probably due to an allergenic response, although persons sensitive to Cr^{6+} also respond to large amounts of Cr^{3+} (Fregert and Rossman, 1964). The ulcers are believed to be due to chromate ion and not related to sensitization. Chromic acid, and, to a lesser extent, chromate, are presumably the causative agents in perforation of the nasal septum (Browning, 1969). Epidemiologic studies indicate that chromate is a carcinogen with bronchogenic carcinoma as the principal lesion. The latent period appears to be 10 to 15 years. The relative risk of chromate plant workers for respiratory cancer is 20 times greater than that of the general population. Experimental studies have suggested that calcium chromate may be the specific carcinogenic agent (Enterline, 1974). However, some investigators have produced cancer in experimental animals with injections of either the trivalent or hexavalent form (Hueper and Payne, 1962). Incorporation of hexavalent chromium (5 ppm) into the drinking water of mice over their lifetimes produced a slightly higher incidence of malignant tumors than in the controls. Trivalent chromium (chromium acetate) given to rats under similar conditions produced no such effect (Schroeder and Mitchner, 1971; Kanisawa and Schroeder, 1969).

COBALT

Occurrence and Use. Cobalt is a relatively rare metal produced primarily as a by-product of other metals, chiefly copper. It is used in high-temperature alloys and in permanent magnets. Its salts are useful in paint driers, as catalysts, and in the production of numerous pigments. It is an essential element in that 1 μg of vitamin B_{12} contains 0.0434 μg of cobalt. Vitamin B_{12} is essential in the prevention of pernicious anemia. If other requirements exist, they are not well understood. Deficiency diseases of cattle and sheep caused by insufficient natural levels of cobalt are characterized by anemia and loss of weight or retarded growth.

Absorption, Excretion, Toxicity. Cobalt salts are generally well absorbed after oral ingestion, probably in the jejunum. Despite this fact, increased levels tend not to cause significant accumulation. About 80 percent of the ingested cobalt is excreted in the urine. Of the remaining, about 15 percent is excreted in the feces by an enterohepatic pathway, while the milk and sweat are other secondary routes of excretion. The total body burden has been estimated as 1.1 mg.

The muscle contains the largest total fraction, but the fat has the highest concentration. The liver, heart, and hair have significantly higher concentrations than other organs, but the concentration in these organs is relatively low. The normal levels in human urine and blood are about 98 and 0.18 $\mu g/l$, respectively. The blood level is largely in association with the red cells.

Significant species differences have been observed in the excretion of radiocobalt. In rats and cattle 80 percent is eliminated in the feces (Schroeder *et al.*, 1967b).

Polycythemia is the characteristic response of most mammals, including man, to ingestion of excessive amounts of cobalt. Toxicity resulting from overzealous therapeutic administration has been reported to produce vomiting, diarrhea, and a sensation of warmth. Intravenous administration leads to flushing of the face, increased blood pressure, slowed respiration, giddiness, tinnitus, and deafness due to nerve damage (Browning, 1969).

High levels of chronic oral administration may result in the production of goiter. Epidemiologic studies suggest that the incidence of goiter is higher in regions containing increased levels of cobalt in the water and soil (Wills, 1966). The goitrogenic effect has been elicited by the oral administration of 3 to 4 mg/kg to children in the course of sickle cell anemia therapy (Browning, 1969).

Cardiomyopathy has been caused by excessive intake of cobalt, particularly in beer to which cobalt was added to enhance its foaming qualities. The onset of the poisoning occurred about one month after cobalt was added in concentrations of 1 ppm. Why such a low concentration should produce this effect in the absence of any similar change when cobalt is used therapeutically is unknown. The signs and symptoms were those of congestive heart failure. Autopsy findings revealed a tenfold increase in the cardiac levels of cobalt. Alcohol may have served to potentiate the effect of the cobalt (Morin and Daniel, 1967).

Hyperglycemia due to alpha cell pancreatic damage has been reported after injection into rats. Reduction of blood pressure has also been observed in rats after injection and has led to some experimental use in man (Schroeder *et al.*, 1967b).

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THE CONDENSED CHEMICAL DICTIONARY

TENTH EDITION

Revised by

GESSNER G. HAWLEY

gh purity (CrF_3).
ating to skin and eyes, especially
nce. 0.5 mg per cubic meter of air.
dyeing woolens; mothproofing;
yst.
ns. (Solid and solution): (Rail,
l.

(chromic hydrate; chromium hy-
n hydrate) $Cr(OH)_3$.
gelatinous precipitate; decom-
xide by heat. Insoluble in water;
strong alkalies.
ding a solution of ammonium
olution of a chromium salt.
n; catalyst; tanning agent; mor-

omium nitrate) $Cr(NO_3)_3 \cdot 9H_2O$.
crystals; soluble in alcohol and
decomposes 100° C.
ction of nitric acid on chromium

idant; toxic; may ignite organic
tact. May be explosive when

sion inhibitor.
ns: Nitrates, n.o.s., (Rail, Air)

omium oxide; chromia; chro-
green cinnabar) Cr_2O_3.
green, extremely hard crystals; sp.
35° C; b.p. 4000° C; insoluble in
kalies.
ating chromium hydroxide; (b)
ammonium dichromate; (c) by
chromate with sulfur and washing
ate.
estion and inhalation. A known
nce, 0.5 mg per cubic meter of air.
green paint pigment; ceramics;
c synthesis; green granules in
mponent of refractory brick;

(chromium phosphate)
(b) $CrPO_4 \cdot 4H_2O$.
crystals; sp. gr. 2.12 (14° C); (b)
ble in acids; insoluble in water.
raction of solutions of chromium
dium phosphate; (b) by mixing
disodium hydrogen phosphate.
powder (not the hexahydrate) is
comes crystalline on contact with
it is converted into green crystal-

atalyst.

hromium sulfate) (a) $Cr_2(SO_4)_3$;
H_2O; (c) $Cr_2(SO_4)_3 \cdot 18H_2O$.
or red powder; (b) dark-green
(c) violet cubes. Sp. gr. (a) 3.012;

(b) 1.867; (c) 1.70. (a) Insoluble in water and acids; (b) soluble in water; insoluble in alcohol. (c) soluble in water and alcohol.
Derivation: Action of sulfuric acid on chromium hydroxide, with subsequent crystallization.
Uses: Chrome plating; chromium alloys; mordant; catalyst; green paints and varnishes; green ink; ceramics (glazes). The basic form (reduction of sodium dichromate) is used in tanning (q.v.).

chromite (chrome iron ore) $FeCr_2O_4$. A natural oxide of ferrous iron and chromium, sometimes with magnesium and aluminum present. Usually occurs in magnesium- and iron-rich igneous rocks.
Properties: Color iron-black to brownish-black; streak dark brown; luster metallic to submetallic; sp. gr. 4.6; Mohs hardness 5.5.
Grades: Metallurgical; refractory; chemical.
Occurrence: U.S.S.R.; So. Africa; Zimbabwe; Philippines; Cuba; Turkey.
Hazard: A known carcinogen. Tolerance, 0.05 mg/cubic meter of air.
Uses: Only commercial source of chromium and its compounds.

chromium Cr Metallic element of atomic number 24, group VIB of the Periodic Table; atomic weight 51.996; valences 2, 3, 6; four stable isotopes. Name derived from Greek for color.
Properties: Hard, brittle, semi-gray metal. Sp. gr. 7.1; m.p. 1900° C; b.p. 2200° C. Compounds have strong and varied colors. Cr ion forms many coordination compounds. Exists in active and passive forms, the latter giving rise to its corrosion resistance, due to a thin surface oxide layer that passivates the metal when treated with oxidizing agents. Active form reacts readily with dilute acids to form chromous salts. Soluble in acids (except nitric) and strong alkalies; insoluble in water.
Occurrence: USSR, So. Africa, Turkey, Philippines, Zimbabwe; Cuba.
Derivation: From chromite (q.v.), by direct reduction (ferrochrome); by reducing the oxide with finely divided aluminum or carbon; and by electrolysis of chromium solutions.
Grades: (ore): Chromium ores are classified as (1) metallurgical, (2) refractory, and (3) chemical, and their consumption in the U.S. is in that order. (1) must contain a minimum of 48% Cr_2O_3 and have chromium-iron ratio of 3 to 1; (2) must be high in Cr_2O_3 and Al_2O_3 and low in iron; (3) must be low in SiO_2 and Al_2O_3 and high in Cr_2O_3.
Forms available: (1) Chromium metal as lumps, granules, or powder; (2) high- or low-carbon ferrochromium (q.v.). (3) Single crystals. High-purity crystals or powder run 99.97% pure.
Hazard: Hexavalent chromium compounds have an irritating and corrosive effect on tissue, resulting in ulcers and dermatitis on prolonged contact. Tolerance for chromium dust and fume is 0.5 mg per cubic meter of air. It is a known carcinogen (OSHA).
Uses: Alloying and plating element on metal and plastic substrates for corrosion resistance; chromium-containing and stainless steels; protective coating for automotive and equipment accessories; nuclear and high-temperature research; constituent of inorganic pigments.

chromium 51. Radioactive chromium of mass number 51.
Properties: Half-life 26.5 days; radiation, gamma (0.32 MeV).
Grade: U.S.P. (as sodium chromate Cr 51 injection).
Hazard: Radioactive poison.
Uses: Diagnosis of blood volume (as tracer).
Shipping regulations: (Rail, Air) Consult regulations.

chromium acetate. See chromic acetate.

chromium acetylacetonate
$[CH_3COCHC(CH_3)O]_3Cr$.
Properties: Purple powder or red-violet crystals; m.p. 216° C; b.p. 340° C, insoluble in water; soluble in acetone and alcohol.
Derivation: Reaction of chromium chloride, acetylacetone and sodium carbonate.
Use: Reduction of detonation of nitromethane.

chromium ammonium sulfate (ammonium chromium sulfate; chrome ammonium alum)
$CrNH_4(SO_4)_2 \cdot 12H_2O$.
Properties: Green powder or deep violet crystals; sp. gr. 1.72; m.p. 94° C. Soluble in water; slightly soluble in alcohol. The aqueous solution is violet when cold; green when hot.
Grades: Technical.
Uses: Mordant; tanning.

chromium boride One of several compounds of chromium and boron, e.g., CrB, CrB_2, and Cr_3B_2. They have high melting points, are very hard and corrosion-resistant, and may be suitable for use in jet and rocket engines.
Properties: CrB, may be crystalline; sp. gr. 6.2; m.p. 1550° C; Mohs hardness 8.5; resistivity 67μ-ohm cm (20° C). CrB_2, sp. gr. 5.15; m.p. 1850° C; hardness 2010 (Knoop); resists oxidation up to 1100° C. Cr_3B_2, may be crystalline; sp. gr. 6.1; Mohs hardness 9+;
Uses: Metallurgical additives; high temperature electrical conductors; cermets; refractories; coatings resistant to attack by molten metals.

chromium bromide. See chromous bromide.

chromium carbide Cr_3C_2.
Properties: Orthorhombic crystals; sp. gr. 6.65; microhardness, 2700 kg/sq mm (load 50 g); m.p. 1890° C; b.p. 3800° C; resistivity 95μ-ohm cm (room temperature). Highest oxidation resistance at high temperatures of all metal carbides; also resistant to acids and alkalies.
Uses: Gage blocks and hot extrusion dies; in powder form, as spray coating material; components for pumps and valves.